

# Brain Tumor Detection Using Machine Learning

## Submitted by:

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## Declaration

I hereby declare that this project titled “**Brain Tumor Detection Using Machine Learning**” is my original work carried out under the guidance of the academic team of Denvey EduGrow. This project has not been submitted elsewhere for any academic degree or certification.

## Student Signature:

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**Date:** 7 January 2026

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## Abstract

Brain tumors are among the most serious neurological disorders, and early diagnosis is crucial for effective treatment. This project focuses on developing a machine learning–based system for detecting brain tumors using MRI images. Image preprocessing and feature extraction techniques are applied before training machine learning models. The developed system demonstrates the effectiveness of machine learning in assisting medical professionals with early and accurate diagnosis.

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# 1. Introduction

Medical imaging plays a vital role in diagnosing brain tumors. However, manual interpretation of MRI scans can be time-consuming and error-prone. Machine learning techniques offer an automated approach to analyze MRI images and assist in accurate tumor detection.

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## 2. Problem Statement

Manual diagnosis of brain tumors from MRI scans requires expert knowledge and significant time. An automated system is needed to efficiently analyze MRI images and provide accurate tumor detection.

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## 3. Objectives

- To analyze MRI brain images
  - To preprocess image data
  - To implement machine learning classification models
  - To evaluate the performance of the models
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## 4. Dataset Description

The dataset consists of MRI brain images classified into two categories:

- Tumor
- No Tumor

The dataset was obtained from publicly available medical image repositories (Kaggle).

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## 5. Methodology

1. Data Collection
  2. Image Preprocessing
  3. Feature Extraction
  4. Model Training
  5. Model Evaluation
  6. Result Analysis
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## 6. Tools & Technologies Used

- Programming Language: Python
  - Libraries: NumPy, Pandas, OpenCV, Scikit-learn
  - Platform: VS Code
  - Version Control: GitHub
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## 7. Machine Learning Model Used

- Random Forest Classifier
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## 8. Performance Evaluation

Evaluation metrics used:

- Accuracy
- Precision
- Recall
- F1-Score

The Random Forest model achieved the highest accuracy.

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## 9. Results and Discussion

The experimental results indicate that machine learning models can effectively detect brain tumors from MRI images. The Random Forest model showed reliable and consistent performance.

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## 10. Conclusion

This project demonstrates the successful application of machine learning techniques in brain tumor detection. The developed system can assist healthcare professionals in early diagnosis and treatment planning.

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## 11. Future Scope

- Deep learning-based tumor detection
  - Real-time prediction systems
  - Web application deployment
  - Integration with hospital databases
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## 12. References

1. Brain MRI Dataset – Kaggle
2. Scikit-learn Documentation
3. Research papers on AI in medical imaging