Brain Tumour Detection
Using
Machine Learning

Project Title:

Brain Tumour Detection

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Program:
AI in Healthcare

Organization:
Denvey EduGrow

Submission Date:
10/1/2026

Declaration

I hereby declare that this project titled **"Brain Tumour Detection "** 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.

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Student Signature
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Acknowledgement

I would like to express my sincere gratitude to **Denvey EduGrow** for providing the opportunity and guidance to complete this project. I am thankful to the mentors and instructors for their continuous support, encouragement, and valuable feedback throughout the project duration.

Abstract

Brain tumours are among the most life-threatening neurological disorders, and early detection is crucial for effective treatment and improved patient survival. This project focuses on developing a **machine learning–based brain tumour detection system** that analyzes medical data to predict the presence of a brain tumour. Multiple machine learning models were trained and evaluated to identify the most accurate approach. The system aims to assist healthcare professionals by providing a reliable and data-driven diagnostic support tool.

1. Introduction

Medical imaging and healthcare data have grown significantly with advancements in technology. However, traditional diagnosis of brain tumours relies heavily on manual interpretation of MRI scans, which can be time-consuming and prone to human error. Machine learning techniques offer an efficient solution by automatically analyzing data patterns and assisting in early diagnosis. This project utilizes machine learning algorithms to detect brain tumours accurately and efficiently.

2. Problem Statement

Manual detection of brain tumours from medical data or MRI scans is complex and may lead to delayed or inaccurate diagnosis. There is a need for an automated system that can efficiently analyze medical data and accurately predict the presence of a brain tumour.

3. Objectives

● To analyze medical datasets related to brain tumour detection
● To implement multiple machine learning algorithms
● To evaluate and compare model performance
● To develop an accurate and reliable brain tumour detection system

4. Dataset Description

The dataset used in this project consists of medical data related to brain tumour diagnosis. It may include features such as:

● Age
● Gender
● Tumour characteristics
● MRI-derived features
● Diagnosis label (Tumour / No Tumour)

The dataset was obtained from publicly available medical repositories or online platforms such as Kaggle.

5. Methodology

1. Data Collection
2. Data Preprocessing (handling missing values, normalization)
3. Feature Selection
4. Model Training
5. Model Evaluation
6. Result Analysis

6. Tools & Technologies Used

- Programming Language: Python
- Libraries: NumPy, Pandas, Scikit-learn, Matplotlib
- Platform: Jupyter Notebook / VS Code
- Version Control: GitHub

7. Machine Learning Models Used

- Logistic Regression
- Decision Tree Classifier
- Random Forest Classifier

Each model was trained using the dataset and evaluated to determine its effectiveness in detecting brain tumours.

8. Performance Evaluation

The models were evaluated using the following metrics:

- Accuracy
- Precision
- Recall
- F1-Score

Among the implemented models, the **Random Forest Classifier** achieved the highest accuracy and provided the most reliable predictions.

9. Results and Discussion

The results demonstrate that machine learning models can effectively detect brain tumours using medical data. The Random Forest model performed best due to its ensemble learning technique and resistance to overfitting. This system can significantly assist medical professionals in early diagnosis.

10. Conclusion

This project successfully demonstrates the application of machine learning techniques in **brain tumour detection**. The developed system provides accurate predictions and can be used as a supportive diagnostic tool in the healthcare domain.

11. Future Scope

● Integration with real-time hospital and MRI systems
● Use of deep learning and CNN models
● Deployment as a web-based or mobile application
● Extension to multi-class tumour classification

12. References

1. Brain Tumour Medical Dataset Repositories
2. Scikit-learn Machine Learning Documentation
3. Research Papers on AI in Medical Imaging