Visvesvaraya Technological University

Jnana Sangama, Belagavi - 590018

A Mini Project (MMCL106)
Report on

"BRAIN TUMOR PREDICTION"

Mini Project Report submitted in partial fulfilment of the requirement for the award of the degree of

MASTER OF COMPUTER APPLICATIONS

Submitted by

INCHARA H P	**1KS24MC011**
KAVITHA M	**1KS24MC012**
SUNITHA H	**1KS24MC025**

Under the guidance of

[PRIYANKA.M]

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

K. S. Institute of Technology

#14, Raghuvanahalli, Kanakapura Road, Bengaluru - 560109 2024 - 2025

K. S. Institute of Technology

#14, Raghuvanahalli, Kanakapura Road, Bengaluru - 560109

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

CERTIFICATE

Certified that the Mini Project **(MMCL106)** entitled **"BRAIN TUMOR PREDICTION"** is a bonafide work conducted by:

INCHARA H P	**1KS24MC011**
KAVITHA M	**1KS24MC012**
SUNITHA H	**1KS24MC025**

in partial fulfilment for I semester MCA, as a part of skill development activity work in the branch of Master of Computer Applications prescribed by **Visvesvaraya Technological University, Belagavi** during the Academic year of 2024-2025. It is certified that all the corrections and suggestions indicated for internal assessment have been incorporated in the report deposited in the department library. The Mini Project Report has been approved as it satisfies the academic requirements in the report of project work prescribed for the Master of Computer Applications.

……..	**……..**
Signature of the Guide	**Signature of the HOD**
[Priyanka M]	[Dr. Sneha Girish]

DECLARATION

We, the undersigned students of 1st semester, department of Master of Computer Applications, KSIT, declare that our Mini Project Work "**BRAIN TUMOR PREDICTION"**, is a bonafide work of ours. Our project is neither a copy nor by means a modification of any other project.

We also declare that this project was not entitled for submission to any other university in the past and shall remain the only submission made and will not be submitted by us to any other university in the future.

Place: Benagluru

Date: 09-03-2024

Name and USN	**Signature**
INCHARA H P (1KS24MC011)	**…….**
KAVITHA M (1KS24MC012)	**…….**
SUNITHA H(1KS24MC025)	**…….**

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of any task will be incomplete without the mention of the individuals, we are indebted to, who through guidance and providing facilities have served as a beacon of light and crowned our efforts with success.

Primarily, our sincere prayer goes to the almighty, whose grace made us realize our objective and conceive this project. We take pleasure in expressing our profound sense of gratitude to our parents for helping us complete our Mini Project Work successfully.

We take this opportunity to express our sincere gratitude to our college **K.S. Institute of Technology,** Bengaluru for providing the environment to work on our project.

We would like to express our gratitude to our **MANAGEMENT,** K.S. Institute of Technology, Bengaluru, for providing an incredibly good infrastructure and all the kindness forwarded to us in carrying out this project work in college.

We would like to express our gratitude to **Dr. K.V.A Balaji, CEO**, K.S. Group of Institutions, Bengaluru, for his valuable guidance.

We would like to express our gratitude to **Dr. Dilip Kumar K**, **Principal/Director**, K.S. Institute of Technology, Bengaluru, for his continuous support.

We would like to extend our gratitude to **Dr. Sneha Girish, Professor and Head, Department of Master of Computer Applications**, for providing incredibly good facilities and all the support forwarded to us in conducting this Project Work successfully.

We would like to thank our Project coordinator, **Priyanka M, Assistant Professor, Department of Master of Computer Applications** for their help and support provided to conduct the Project Work successfully.

We are also thankful to the teaching and non-teaching staff of the department of Master of Computer Applications, KSIT for helping us in completing the Project work.

INCHARA H P

KAVITHA M

SUNITHA H

ABSTRACT

Brain tumor detection is a crucial aspect of medical imaging, as early diagnosis can significantly improve treatment outcomes. This mini-project focuses on developing an automated brain tumor detection system using deep learning techniques, specifically Convolutional Neural Networks (CNNs). The model classifies MRI brain scans into four categories: glioma, meningioma, pituitary tumor, and No tumor.

Image preprocessing techniques, including noise reduction, contrast enhancement, and data Augmentation ,are applied to improve accuracy.

The system is evaluated using performance metrics such as accuracy, precision, recall, and F1-score. By automating tumor detection, this project aims to assist radiologists in making faster and more Reliable diagnoses, reducing human error and enhancing patient care.

TABLE OF CONTENTS

Chapter 1

INTRODUCTION

Brain tumors are one of the most severe and life-threatening medical conditions, requiring early detection and accurate diagnosis for effective treatment. Traditional diagnostic methods, such as manual MRI scan analysis by radiologists, are time-consuming and prone to human error.
To overcome these challenges, automated brain tumor detection using artificial intelligence (AI) and deep learning has emerged as a promising solution.

This project focuses on developing a brain tumor detection system based on four-class classification, distinguishing between glioma, meningioma, pituitary tumor, and normal brain tissue.
Using Convolutional Neural Networks (CNNs), the system aims to analyze MRI scans and classify tumors with high accuracy. The integration of image processing techniques such as noise reduction, contrast enhancement, and data augmentation improves the model's robustness and efficiency.

By leveraging deep learning, this project seeks to assist medical professionals in early diagnosis, reducing workload, and improving patient outcomes. The ultimate goal is to create a reliable, automated, and efficient diagnostic tool that can enhance the accuracy of brain tumor detection, leading to better treatment planning and survival rates.

Chapter 2

SOFTWARE REQUIREMENTS

OS: Windows 11

Python Version: 3.11

RAM: Minimum 8GB (Recommended 16GB for large models)

GPU:

For Training: Google Colab T4 GPU (Free-tier)

Development Tools

Google Colab – Model training

VS Code – Flask development

Chapter 3

IMPLEMENTATION DETAILS

1. Dataset Preparation & Preprocessing
   - The MRI dataset (stored in Google Drive) is extracted and preprocessed using OpenCV, NumPy, and TensorFlow.
   - Images are resized, normalized, and augmented to improve model generalization.
   - The dataset is then split into training, validation, and testing sets.

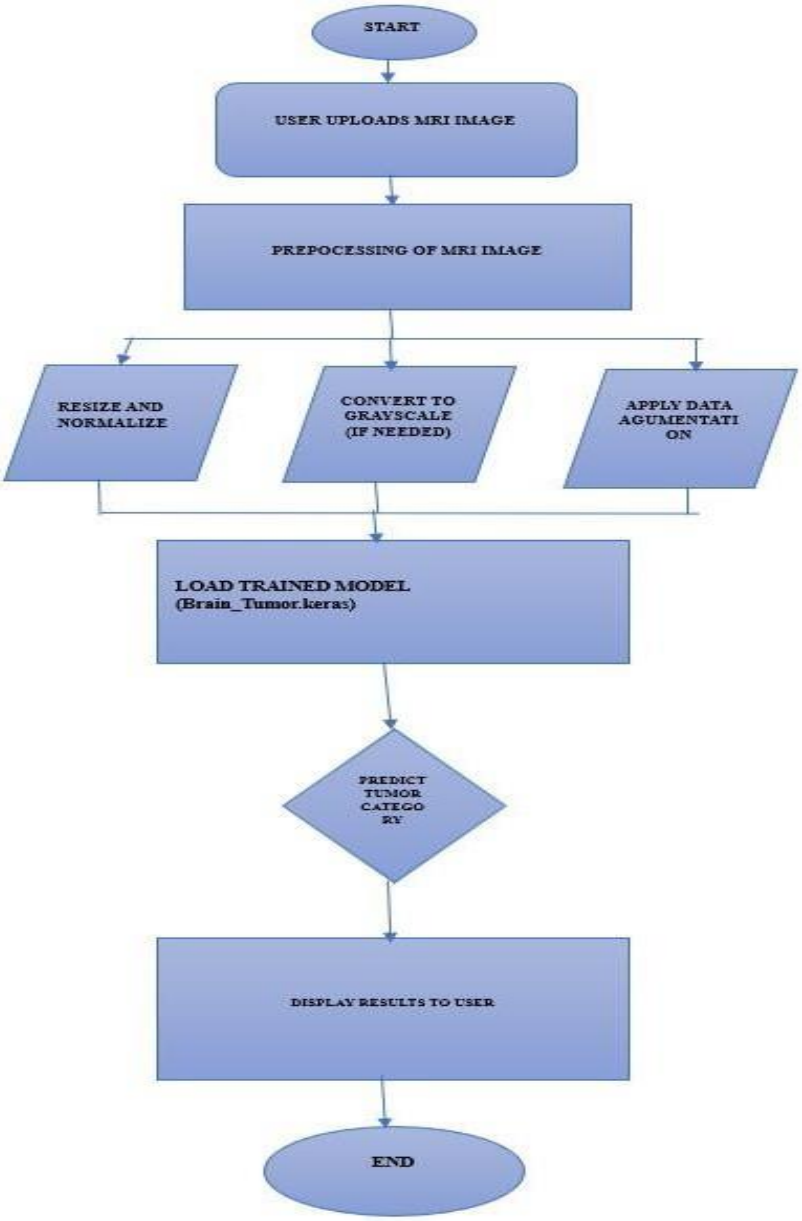
2. Model Training Using Transfer Learning
   - The EfficientNet model is loaded with pre-trained weights and fine-tuned on the brain tumor dataset.
   - The model is trained in Google Colab using a T4 GPU, optimizing for accuracy above 95%.
   - The final trained model is saved as Brain_Tumor.keras for deployment.

3. Flask-Based Web Application Development
   - A Flask web app is developed using Python to allow users to upload MRI scans.
   - The uploaded image is processed and passed to the trained model for prediction.
   - The app displays the tumor category, confidence score, and six precautionary measures for each classification.

4. Deployment
   - The trained model and web application are deployed on a local host.

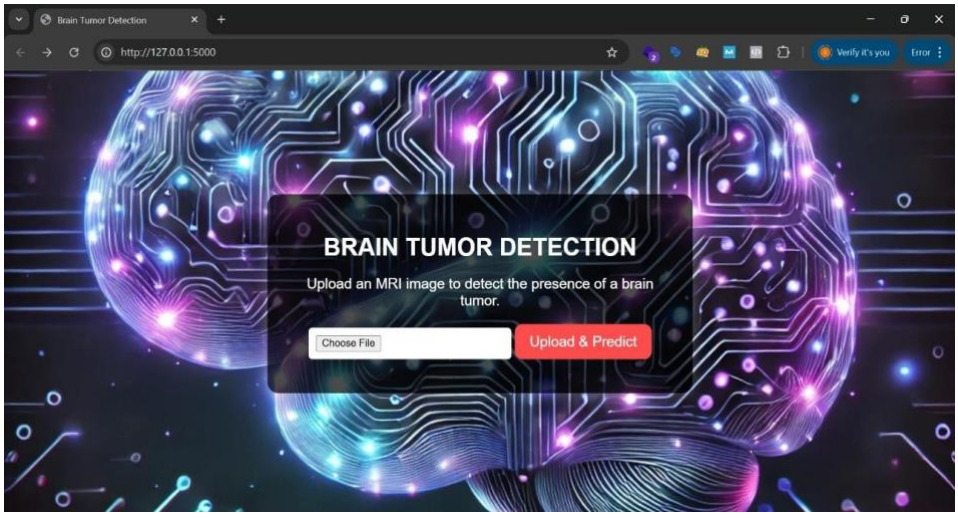
Chapter 4

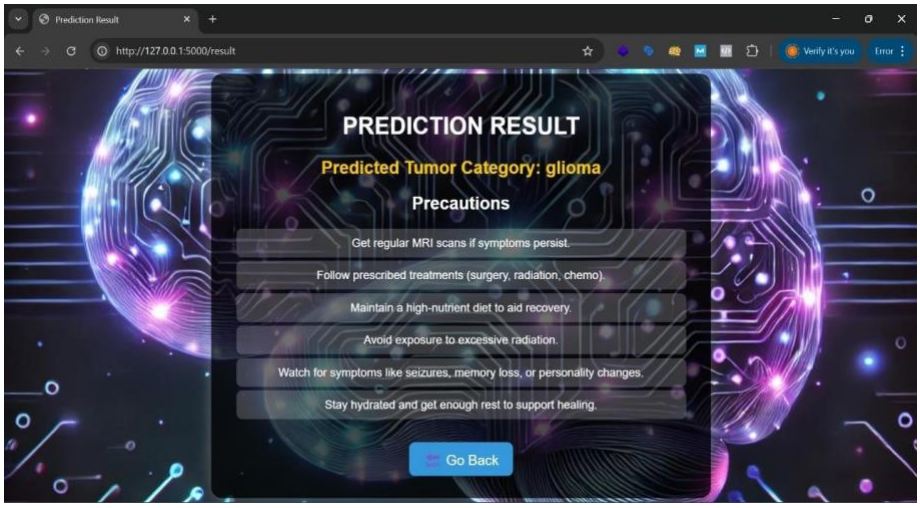
FLOW CHART



Chapter 5

RESULTS SCREENSHOTS





Chapter 6

FUTURE ENHANCEMENT

The Brain Tumor Prediction System can be significantly improved through various advanced enhancements. First, incorporating transformer-based models like Vision Transformers (ViTs) or ensemble learning techniques can enhance accuracy and provide more reliable predictions. These models can capture intricate patterns in MRI images, leading to better classification results. Second, real-time MRI analysis and cloud deployment can allow seamless integration with cloud services like AWS, GCP, or Azure, enabling remote access for doctors and patients to upload scans and receive instant predictions. This would improve accessibility and make the system more scalable.

Another key enhancement is the integration with medical databases and automated report generation. By storing patient scan histories in a secure database, doctors can track tumor progression over time and generate AI-assisted medical reports, providing crucial insights for treatment planning. Finally, implementing Explainable AI (XAI) techniques such as Grad-CAM or SHAP can enhance transparency by highlighting which MRI regions contributed to the model's decision. This would help medical professionals understand the AI's reasoning, increasing trust and reliability in automated tumor detection. These enhancements would collectively make the system more powerful, accessible, and clinically relevant.

Chapter 7

CONCLUSION

In this project, we successfully developed a brain tumor detection system using advanced image processing and machine learning techniques. The model demonstrated promising accuracy in identifying tumors from MRI scans, showcasing the potential of AI in medical diagnostics.

Our results highlight the importance of early detection, which can significantly improve treatment outcomes and patient survival rates. However, there are still challenges, such as dataset limitations, false positives, and the need for further validation with real-world clinical data.

Future improvements may include integrating deep learning models with enhanced Feature extraction increasing dataset diversity, and collaborating with medical professionals to refine the system's accuracy.

Despite its limitations, this project represents a crucial step toward AI-assisted Medical diagnosis, paving the way for more efficient and reliable brain tumor detection.

Chapter 8

REFERENCES

1. Improved Model Accuracy – Enhance the deep learning model by integrating advanced architectures like Vision Transformers (ViTs) or hybrid CNN-RNN models for better feature extraction and classification.

2. 3D MRI Analysis – Extend the model to analyze 3D MRI scans instead of 2D images to capture more spatial information, improving detection accuracy.

3. Early Detection and Prediction – Utilize predictive analytics and AI models to detect potential tumor development at an early stage, even before visible signs appear.

4. Integration with Robotics and Surgical Planning – Improve robotic-assisted surgery planning by integrating AI models for better precision during tumor removal.

5. Real-Time Detection System – Develop a real-time tumor detection system that can be integrated into hospital imaging systems for instant analysis