🧠 Brain Tumor Detection using MRI Images

GTC Final Project – Team 14

Contents

Problem Statement

Brain tumors are life-threatening and require early, accurate detection.

Manual analysis of MRI scans is:

- Time-consuming
- Subject to human error

Need for an automated, reliable solution.

Project Overview

- Built a machine learning pipeline for brain tumor classification.
- Compared baseline models with deep learning CNN.
- Final solution → Web application for real-time detection.

Dataset & Preprocessing

Dataset

Public dataset contains MRI scans classified into 4 classes:

- **Glioma**
- **Meningioma**
- **Pituitary**
- **No Tumor**

Preprocessing Steps:

01

Image Resizing & Normalization

- Resize all MRI images to 128×128 pixels
- Normalize pixel values to range 0–1

02

Data Augmentation:

- Apply transformations (rotation, flipping, zooming)
- Increases dataset diversity & reduces overfitting

03

Dataset Splitting

- Split into Training / Validation / Test sets
- Ensures reliable evaluation of model performance

Data Preparation

Dataset Shuffling

- Ensures randomness and prevents order bias

Data Balancing

- Reduces overfitting toward majority classes

Batching

- Splitting data into manageable mini-batches

Ready-to-Model Format

- Processed and augmented data is fed into the models

Feature Building 🧩

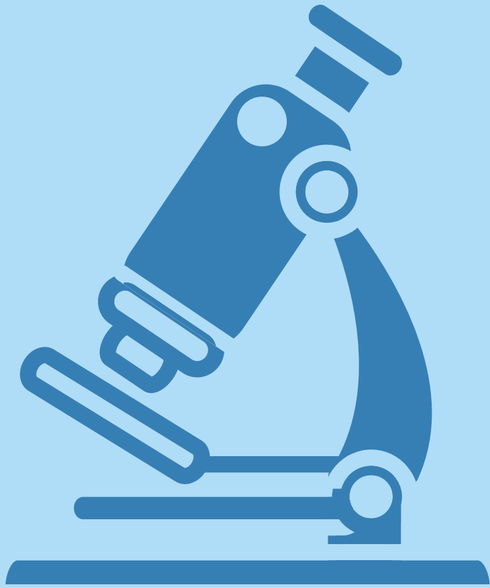
CNN Filters extract meaningful features

- **Low-level: edges, shapes**
- **Mid-level: textures**
- **High-level: tumor patterns**

These features are used by:

- **SVM (baseline)**
- **MobileNetV2 (transfer learning)**
- **CNN (custom architecture)**

Modeling & Results🧪

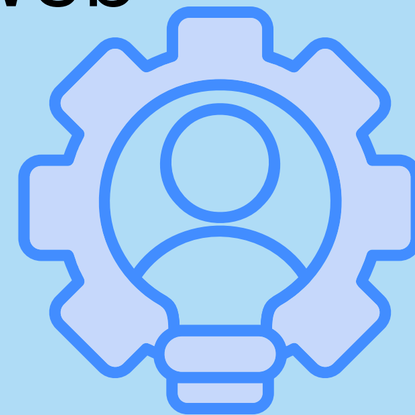


Models Tested:

- Support Vector Machine (SVM) → Accuracy: 65%
- MobileNetV2 (Transfer Learning) → Accuracy: 87.7%
- Convolutional Neural Network (CNN) → Accuracy: 95.5% ✅

Best Model (CNN):

- Achieved high precision, recall, and F1-scores across all tumor classes
- Especially strong performance on Glioma and Pituitary detection
- Selected as the final deployed model in the web application



📄 For full model results and detailed metrics, check the report:

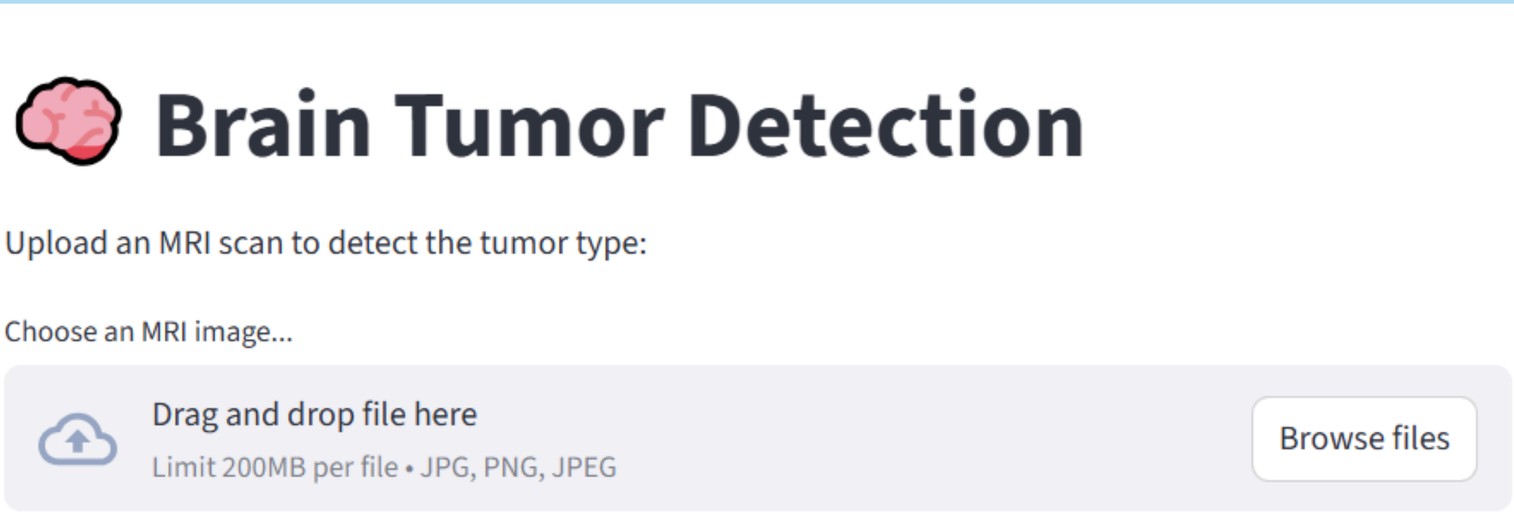
🔗 View Full Report Here

Web Application (User-Friendly Interface)

Simple and intuitive web application
Easy image upload for tumor detection
Real-time predictions with high accuracy

🔗 **View the Project Web Application Here**

🎥 **Watch the Demo Video Here**



Impact / Real-World Use Case

Why This Matters?

Early detection saves lives

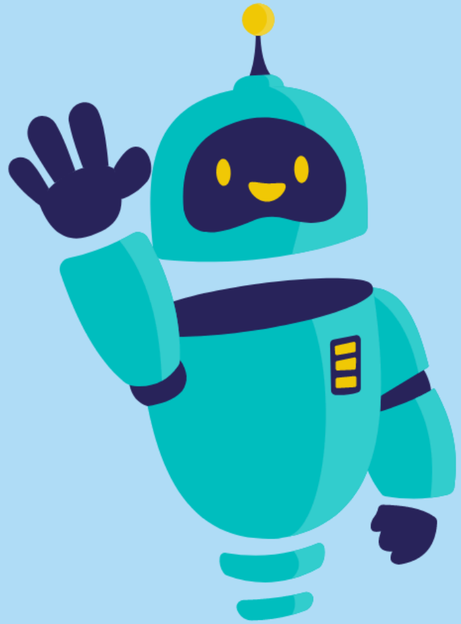
Helps radiologists with faster diagnosis

Potential integration with hospital systems

Meet Our Team & See Each Member's Contribution:

- **Sama Mobtasem** → Data Preparation
- **Hoor Ashraf** → Exploratory Data Analysis (EDA)
- **Sama Samer** → Feature Building
- **Maysoun Hassan** → Model Training
- **Aya Ayman** → Validation
- **Rawan Sotohy** → Web application deployment, Presentation design, demo video & Report writing

Thanks for watching our presentation



Project Links👇

🔗 View the Project Repository Here

🔗 View the Web Application Here