Brain Tumor Detection Web App (Deep Learning)

This project detects brain tumors in brain MRI images using a **Convolutional Neural Network (CNN)** built with TensorFlow and Keras. The web app classifies uploaded MRI images into **four categories**:

- Glioma
- Meningioma
- Pituitary
- No Tumor

It provides prediction confidence, batch upload functionality, downloadable PDF reports, and visualizes model results in a user-friendly interface.

Project Structure

```
Brain_Tumor_Detection_WebApp/
├── static/
│   ├── uploaded/        # Uploaded MRI images
│   ├── docs/            # Project synopsis and diagrams
│   ├── css/             # Stylesheets
│   └── icons/           # Favicon and logo
├── templates/
│   ├── index.html       # Home page / upload page
│   ├── documents.html   # Document download/view page
│   └── other pages...
├── model/
│   └── multi_class_model.keras  # Trained multi-class CNN model
├── flask_routes.py      # Flask route handlers
├── logic.py             # Prediction logic
├── app.py               # Flask app entry point
├── requirements.txt     # Python dependencies
```

└── README.md # Project documentation

Requirements

- Python 3.10+
- TensorFlow
- NumPy
- OpenCV
- Matplotlib
- scikit-learn
- Flask

Install dependencies:

pip install -r requirements.txt

Usage

1. Run the Web App
python app.py

- Open your browser at http://127.0.0.1:5000/.
- Upload **single or multiple MRI images**.
- View predictions with **confidence scores**.
- Download a **PDF report** summarizing results.

2. View Documents

- Access the **Documents** page in the app to view/download:
  - Project Synopsis (PDF)
  - Design diagrams (PNG)

Model Details

- **Input:** 224x224 RGB brain MRI images (preprocessed)
- **Architecture:** Transfer learning using **MobileNetV2** with custom Dense layers
- **Output:** 4 neurons (softmax for multi-class classification)
- **Loss:** categorical_crossentropy
- **Optimizer:** Adam

- **Additional Features:** Dropout for regularization, batch prediction support

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Notes

- This system is for **academic, research, or training** purposes only. It is **not a medical diagnostic tool**.
- Images should be **brain MRI scans**; other image types may produce unreliable predictions.
- Predictions are displayed with **confidence percentages** for transparency.

Author

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