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TITLE – DeepBrain: An Explainable Deep Learning Approach for Brain Tumor Classification Using MobileNetV2

ABSTRACT

# This project introduces *DeepBrain*, an end-to-end deep learning framework for automated brain tumor classification using transfer learning with MobileNetV2. The system classifies MRI scans into four categories—glioma, meningioma, pituitary tumor, and no tumor—using a fine-tuned MobileNetV2 architecture enhanced with batch normalization, dropout, and L2 regularization. A robust image preprocessing pipeline using Keras’ ImageDataGenerator ensures effective data augmentation and normalization. The frontend, built with HTML, CSS, and JavaScript, allows users to input patient details, upload multiple MRI images, visualize predictions with Grad-CAM overlays, and download detailed PDF reports. The backend is powered by FastAPI, handling prediction requests, generating explainable Grad-CAM heatmaps, and dynamically creating medical-grade reports with diagnosis, probability scores, and treatment suggestions. Model evaluation includes accuracy, ROC-AUC, confusion matrix, and classification reports. This lightweight, scalable, and explainable system is suitable for use in clinical environments, rural telemedicine, educational simulations, and real-time triage scenarios, providing transparency, usability, and diagnostic support beyond what was explored in the base research paper.

# Keywords:

Brain Tumor Classification, MobileNetV2, Deep Learning, Grad-CAM, FastAPI, Explainable AI, Medical Image Analysis.

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