
NeuroHeal: AI-Driven Explainable Brain Tumor Diagnostic System Using MRI and Transfer Learning

Dnyanda Shinde

Department of Computer Science and Engineering (Artificial Intelligence), Vishwakarma Institute of Technology, Pune, India

Riya Somani

Department of Computer Science and Engineering (Artificial Intelligence), Vishwakarma Institute of Technology, Pune, India

Poorva Sonawane

Department of Computer Science and Engineering (Artificial Intelligence), Vishwakarma Institute of Technology, Pune, India

Piyush Singh

Department of Computer Science and Engineering (Artificial Intelligence), Vishwakarma Institute of Technology, Pune, India

Shivam Dubey

Department of Computer Science and Engineering (Artificial Intelligence), Vishwakarma Institute of Technology, Pune, India

Abstract

NeuroHeal is an AI-based diagnostic framework for early brain tumor detection that automates MRI image analysis by using transfer-learning-enabled Convolutional Neural Networks. This system employs a transfer-learning-based MobileNetV2 architecture (pretrained on ImageNet with 14M images) augmented with a custom CNN classification head consisting of progressively dense layers (512→256→128→1 neurons with BatchNorm and Dropout) to achieve 98.45% accuracy in binary brain tumor detection from MRI scans. A modular, no-code-assisted architecture enables use in low-resource and educational settings while supporting future integration of segmentation models, multimodal clinical data, and telemedicine workflows. NeuroHeal combines accuracy, transparency, and usability to improve early neurooncology screening and offer reliable AI-based decision support for both radiologists and learners.

Index Terms

Brain Tumor Detection; MRI; Convolutional Neural Network; Transfer Learning; Explainable AI; Medical Image Analysis; AI-based Decision Support.