

# Computer-Aided Brain Tumor Analysis Using Deep Neural Models

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**Abstract:** Brain tumor detection is one of the most challenging tasks in medical image analysis due to the complexity of brain structures and the variability in tumour size, shape, and location. Magnetic Resonance Imaging (MRI) is widely used for brain tumour diagnosis because it provides high-resolution images without exposing patients to ionizing radiation. However, manual interpretation of MRI scans is time-consuming and highly dependent on expert radiologists, which can lead to delays and diagnostic inconsistencies. This research presents an automated brain tumour detection system using deep learning techniques based on transfer learning. The proposed system utilizes the VGG16 convolutional neural network to classify brain MRI images into four categories: glioma, meningioma, pituitary tumor, and no tumor. A publicly available Kaggle dataset is used for training and testing. Image preprocessing and data augmentation techniques are applied to improve generalization and reduce overfitting. Experimental results demonstrate that the proposed approach achieves reliable classification performance and can serve as an effective decision-support tool for medical professionals

**Keywords:** Brain Tumor Detection, MRI, Deep Learning, Convolutional Neural Network, VGG16, Transfer Learning.