Tumor Detection and Classification of MRI Brain Image Using XCeption CNN

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Abstract

Brain tumors present significant diagnostic challenges due to their complex morphology and impact on critical neurological functions. This paper proposes a deep learning approach for classifying brain tumors using the Xception Convolutional Neural Network (CNN) architecture. The system categorizes MRI brain images into four classes: glioma, meningioma, pituitary tumor, and no tumor. A comprehensive preprocessing pipeline, including normalization, augmentation, and resizing, enhances model performance. The trained model achieves a classification accuracy of 88% and is evaluated using precision, recall, F1-score, and a confusion matrix. For real-world usability, the model is integrated into a Flask-based web application, enabling clinicians to upload MRI images and receive instant predictions with confidence levels. This automated system aims to support radiologists with fast and reliable diagnostic assistance, contributing to improved clinical outcomes.

Keywords

Brain Tumor Detection, Deep Learning, MRI Classification, Medical Image Analysis, Xception CNN.