Brain Tumor Detection using Deep Learning(Android)

Abstract

Brain tumors represent a critical medical challenge due to their complexity and the need for timely and accurate diagnosis to facilitate effective treatment and enhance patient outcomes. This study presents an integrated approach for brain tumor detection using advanced deep learning techniques, implemented within both a web-based platform and an Android application. The dataset comprises a diverse collection of MRI scans, including both benign and malignant tumors, which provides a comprehensive foundation for robust model training and validation.

The proposed methodology begins with preprocessing the MRI scans to standardize image resolutions and enhance data consistency. Data augmentation techniques are then employed to expand the dataset, which improves the generalization and robustness of the deep learning models. For brain tumor detection, we utilize Convolutional Neural Networks (CNNs), known for their efficacy in medical image analysis due to their ability to capture spatial hierarchies in images.

The trained model is embedded into a web-based platform developed using the Django framework. This platform allows users to upload MRI scans and obtain real-time diagnostic predictions. To broaden accessibility and usability, an accompanying Android application is developed. The Android app enables users to interact with the detection system directly from mobile devices, facilitating image uploads and predictions via network communication.

Key features of both the web-based platform and the Android application include seamless image uploads, real-time prediction results, and visualization of diagnostic outcomes. The system's performance is rigorously evaluated using metrics such as accuracy, sensitivity, specificity, and the area under the receiver operating characteristic curve (AUC-ROC). Preliminary results indicate that the deep learning approach demonstrates high precision in detecting and classifying brain tumors, distinguishing between benign and malignant cases effectively.

This research advances the field of medical imaging and healthcare technology by offering a practical solution for early brain tumor detection. The integration of state-of-the-art machine learning models with user-friendly interfaces aims to improve diagnostic accuracy and accessibility, ultimately contributing to better patient care and outcomes in neurology and oncology.

In conclusion, the development and implementation of advanced machine learning models within both web and mobile applications represent a significant step forward in medical diagnostics. This integrated system not only facilitates early detection and intervention for brain tumors but also supports ongoing efforts to improve patient care and prognosis, reflecting a meaningful advancement in the application of technology in healthcare.