

An AI-Driven Framework for Brain Tumour Detection and Classification using Ensemble Deep Neural Support Vector Machines (EDN-SVM)

The development of abnormal brain cells, some of which may become cancerous, leads to brain tumors—a condition that demands timely and precise diagnosis for effective treatment. Artificial Intelligence (AI) has emerged as a transformative technology in medical imaging, enabling automated detection and classification of diseases. This research proposes an AI-driven framework for MRI brain tumour detection that integrates image processing, deep learning, and ensemble machine learning techniques. MRI images are first preprocessed using the Adaptive Contrast Enhancement Algorithm (ACEA) and median filtering to enhance image quality. Fuzzy C-Means (FCM) segmentation is employed to isolate tumour-affected regions. From the segmented images, textural features such as energy, entropy, mean, and contrast are extracted using the Gray-Level Co-occurrence Matrix (GLCM). The extracted features are then classified using an **Ensemble Deep Neural Support Vector Machine (EDN-SVM)** — a hybrid AI model that combines the deep feature learning capabilities of neural networks with the robust classification power of SVMs. Experimental results demonstrate high performance with an accuracy of **97.93%**, sensitivity of **92%**, and specificity of **98%**, outperforming conventional machine learning approaches. The proposed AI model thus provides an efficient, accurate, and automated solution for brain tumour detection, potentially aiding radiologists in clinical decision-making.