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**MACHINE LEARNING AND DEEP LEARNING APPROACHES ON BRAIN TUMOR DETECTION**

The brain tumor is still a major source of morbidity and death in the world. With the help of early and precise diagnosis, the treatment should be very effective and with good results concerning the patient. This paper is dedicated to the classification of brain tumors with the use of enhanced machine learning and deep learning by means of image data. The dataset was taken from Kaggle and An open-source medical imaging data was used with four classes, such as glioma, meningioma, pituitary tumor, and normal. Data preprocessing techniques were used to increase dataset diversity. The data split into 80% training and testing 20%. The deep learning models include Convolutional Neural Networks (CNN), MobileNetV2 and Multi-Layer Perceptron (MLP). Convolutional Neural Networks (CNN) shows 93% and MobileNetV2 shows 94%. There was further improvement on the ensembles model that was used alongside a Multi-Layer Perceptron and it obtained a maximum accuracy of 97%. In the current study, all the data were medical images alone without the participation of numerical data, as compared to the previous ones of a similar nature. Additionally, the given system was implemented as a web-based application developed with the help of the Streamlit framework, which makes it clinically usable in real-time, and requires no other databases. These outcomes confirm the prospective of deep learning and ensemble models in the field of medical image classification and verify the idea of its further improvement by enhanced data preprocessing and model optimization. Such a procedure has good potential to be used in clinical diagnosis.

Keywords:Brain tumor detection, Machine learning, Deep learning, Multi-modal classification, Web deployment