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NeuroML - Brain Tumor Classification using Machine Learning and Deep Learning

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Abstract: *In this study we have proposed CNN model's efficacy in accurately classifying brain tumors into meningioma, glioma, and pituitary tumor categories, showcasing high sensitivity and specificity. The incorporation of deep learning techniques empowers the model to discern subtle and intricate patterns, contributing to heightened diagnostic precision. This study underscores the potential of advanced machine learning algorithms in medical imaging for specific brain tumor classification, offering a valuable tool for healthcare professionals. The research findings hold promise for improving the accuracy of neuro-oncological diagnoses, ultimately advancing patient care in the domain of brain tumor pathology. The study utilizes a diverse dataset comprising magnetic resonance imaging (MRI) scans of the brain, encompassing various tumor types and conditions. The preprocessing phase involves standardizing and augmenting the dataset to ensure optimal model training. A Convolutional Neural Network architecture is designed to automatically learn discriminative features from the input images, capturing intricate patterns indicative of tumor presence. Results demonstrate the proposed CNN model's efficacy in accurately classifying brain tumors into meningioma, glioma, and pituitary tumor categories, showcasing high sensitivity and specificity. The incorporation of deep learning techniques empowers the model to discern subtle and intricate patterns, contributing to heightened diagnostic precision. This study underscores the potential of advanced machine learning algorithms in medical imaging for specific brain tumor classification, offering a valuable tool for healthcare professionals. The research findings hold promise for improving the accuracy of neuro-oncological diagnoses, ultimately advancing patient care in the domain of brain tumor pathology. In our work, CNN gained an accuracy of 99.3 %, which is very compelling. The main aim of this paper is to distinguish between normal and abnormal pixels, based on texture based and statistical based features.*

Keywords: Brain Tumor, Meningioma, Glioma, Pituitary, Machine Learning, Deep Learning, Convolutional Neural Network (CNN).

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