

# Medical Image Analysis for Brain Tumor Diagnosis

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**Abstract:** *The importance of early detection of brain tumors is paramount. Brain tumors are graded by biopsy, which can be done only by definitive brain surgery computational intelligence-based methods may assist doctors in detecting and classifying brain tumors. In this study, we considered two deep learning techniques and multiple machine learning solutions for diagnosing four kinds of tumor, i.e, glioma, meningioma, and pituitary gland tumor, no tumor alongside normal brains devoid of tumors with the help of magnetic resonance brain images in order to facilitate the doctors in early detection of the tumors with good accuracy. Materials and methods a database of 3264 magnetic resonance imaging (MRI) brain images including glioma, meningioma, pituitary gland, no tumor and normal brains was utilized in this research. The data was collected from the National Institutes of Health (NIH) database. Initially, preprocessing and augmentation algorithms were applied to MRI brain images. Subsequently, a new 2d convolutional neural network (CNN) and a convolutional auto-encoder network, both previously trained using our assigned hyperparameters, were developed. Then CNN consists of multiple convolution layers, each layer in this hierarchical network has a 22-kernel function. This network consists of eight convolutional and four pooling layers, with batch-normalization layers applied after each convolution layer. The altered auto-encoder network is comprised of a convolutional auto-encoder network and a convolutional classifier network utilizing the final output encoder layer of the first segment, additionally, six machine learning methods used to classify a brain tumor..*

**Keywords:** convolutional neural network, brain tumor, machine learning, medical image

