



Brain tumour detection using machine and deep learning: a systematic review

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Abstract

Brain tumors rank as the 10th leading cause of mortality worldwide, accounting for 85% to 95% of all primary nervous system malignancies. The prevalence of this life-threatening disease is steadily increasing worldwide, highlighting the urgent need for an early and precise diagnosis. Timely identification is critical for initiating effective treatment and improving patient survival chances. Delayed diagnosis significantly elevates the risk of mortality. However, the heterogeneous nature of tumor cells poses challenges for radiologists, making manual diagnosis from magnetic resonance imaging (MRI) images time-consuming and complex. Machine learning (ML) and deep learning (DL) have become useful tools in medical image analysis. These techniques facilitate the automated extraction of intricate patterns and features from MRI images, thereby facilitating a more accurate and efficient tumor diagnosis. Furthermore, these algorithms have demonstrated the capability to handle the intricacy and variability of brain tumor characteristics, thereby improving the diagnostic process. A range of deep learning-based algorithms have been utilized to detect brain tumors, yielding impressive results. The purpose of this paper is to provide an exhaustive examination of the latest techniques used for diagnosing brain tumors from MRI imaging, utilizing machine and deep learning technologies. Moreover, it seeks to outline potential avenues for future exploration within this field. The profound insights gleaned from this comprehensive review are poised to offer invaluable guidance and support to both researchers and medical professionals in the healthcare industry.

Keywords Brain tumor detection · Deep learning · MRI · Segmentation · Classification · Medical image processing · Machine learning

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