
Brain tumour segmentation for overall survival prediction

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Abstract: Gliomas present significant challenges due to their heterogeneous and infiltrative nature, making accurate segmentation essential for effective treatment. Manual segmentation methods are highly labour-intensive and often inadequate. This study introduces a novel pipeline for improving glioma management, beginning with advanced MRI preprocessing. We propose two attention-gated UNet architectures, the dual convolution attention gated UNet and the channel attention gated UNet, for precise tumour segmentation. Radiomic features, including the grey-level co-occurrence matrix and grey-level dependence matrix, are extracted to capture detailed tumour characteristics. Clinical data, such as age and resection status, are integrated alongside radiomic features to enhance survival models. A stacking ensemble model, combining a random forest regressor and multilayer perceptron, predicts survival based on integrated data. Validation on the BraTS 2018 dataset shows that dual convolution attention gated UNet excels in both segmentation accuracy and survival prediction, highlighting the potential of these advanced technologies for glioma management.

Keywords: gliomas; segmentation; dual channel attention gated UNet; survival prediction.

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Biographical notes: Novsheena Rasool received her BTech in Computer Science and Engineering from the University of Kashmir in 2016 and MSc degree in Information Technology from the Islamic University of Science and Technology (IUST), Kashmir, Jammu and Kashmir, India in 2018, where she is currently pursuing her PhD at the Department of Computer Science. Her research interests include deep learning, machine learning, and medical image analysis. And she has served as the first author on several papers indexed in Scopus.