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.