

Innovation/Impact: We consider this study to be innovative because it illustrates a state-of-the-art learning algorithm for brain tumor segmentation on multimaodal MRI scans and prediction of patient-specific overall survival. Brain tumor delineations/contouring is conventionally performed manually by a trained radiation oncologist, and the process involves a considerable amount on time as well as effort. In addition, for a given tumor delineation task, there are significant variations among the radiation oncologists in contouring the tumor. Automatic tumor segmentation could have the potential for improved diagnosis, treatment planning, and follow-up of individual patients. Moreover, it could serve as a supportive tool for radiotherapy planning or replace the conventional segmentation methods. It would be very useful for standardizing the segmentation process and significantly expediting clinic work-flow. Patient-specific overall survival (OS) prediction using the segmented tumor in combination with patient age and tumor radiomic/imaging features could serve as a survival-predictor (personalized medicine) and provide an informative clue about the patient treatment outcome.

Key Results: The results of our learning algorithm for brain tumor, edema structure, are shown in Fig. 1. The patient overall survival predicted results, regression and classification principles, from the segmented data and patient’s age parameter were represented in Fig. 2.

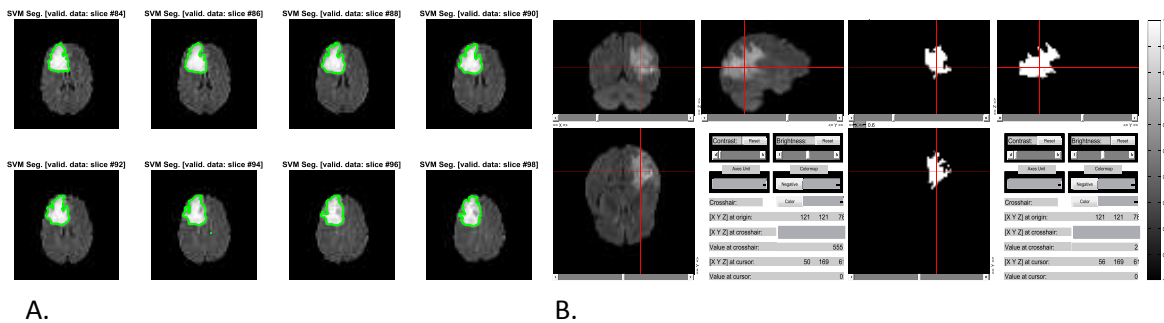


Fig. 1. Predicted segmentation labels (green), edema structure, on a T2-Flair MRI validation data with our automated learning algorithm. A: axial view (slice# 84:2:98), and B: coronal, sagittal, & axial view of the MRI (left) and the predicted segmentation (right). Mean dice similarity score was 0.53 ± 0.32 .

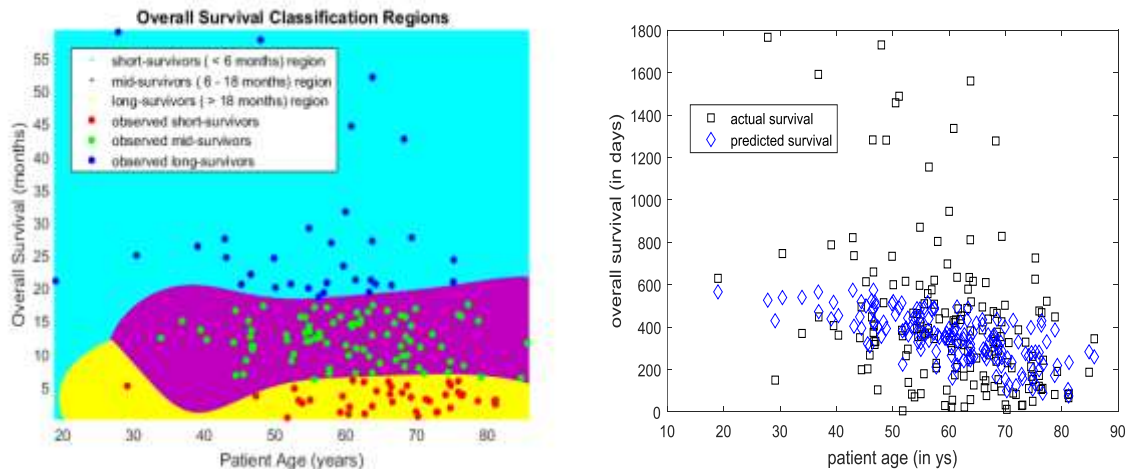


Fig. 2. Scatter plot of the OS predictions GBM patients. Left: OS class predicted regions; Right: Predictated regression. Prediction accuracy was 0.99 for short, medium, and long-survivor classifications, and 0.49 for OS regression (estimating a value).