

Multiparametric MRI analysis of Glioblastoma Multiforme tissues using Support Vector Machines

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Glioblastoma Multiforme (GBM) is the most prevalent and aggressive type of malignant brain tumor affecting humans. The median survival ranges from 4.5 months with no treatment, to 15 months with resection, radiation therapy, and chemotherapy. Recurrence occurs in nearly 95% of patients, and this is due in part to the highly infiltrative and heterogeneous nature of GBM. The ability to better characterize the heterogeneous makeup of these tumors could allow for more aggressive treatment. Our study consisted of collecting multiple MR images from patients with confirmed GBM, including: T2, post-contrast T1, perfusion based rCBV, diffusion (ADC), and a carbogen-based hypoxia map. These images were collected for each patient and coregistered to provide the data matrix. They were then analyzed by a radiologist and assigned tissue labels to complete the input matrix for the support vector machine classifier (SVM). This document will discuss the ability of a support vector machine classifier to effectively classify tumor, necrosis, edema, and non-enhancing (NCE) tumor tissues based on the multiparametric MRI data in patients with GBM. Specifically, we investigate and compare the methodology involved in the model selection and optimization process. Our goal is to provide a streamlined approach for dealing with large MRI datasets, and the implementation of the SVM framework on a voxel-by-voxel level.