Spatial Bayesian Variable Selection Models on Functional Magnetic Resonance Imaging Time-Series Data

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Abstract

One of the major objectives of fMRI (functional magnetic resonance imaging) studies is to determine subject-specific areas of increased blood oxygenation level dependent (BOLD) signal contrast in response to a stimulus or task, and hence to infer regional neuronal activity. We posit and investigate a Bayesian approach that incorporates spatial and temporal dependence and allows for the task-related change in the BOLD signal to change dynamically over the scanning session. In this way, our model accounts for potential learning effects, in addition to other mechanisms of temporal drift in task-related signals. We study the properties of the model through its performance on simulated and real data sets.