

A Spatial Modeling Framework for Functional Neuroimaging Data

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Functional magnetic resonance imaging (fMRI) studies have been used to characterize local properties of behavior-related neural activity and to investigate regional associations in brain activity. fMRI is also useful for determining differences in distributed neural processing between subgroups, e.g. schizophrenia patients and healthy controls. fMRI studies produce massive data sets that pose challenges for the development of appropriate statistical methods. The data from fMRI studies consist of 3-D movies for each subject, contain a large number of spatial locations (voxels) within each scan, and exhibit complex patterns of spatial and temporal correlations. In this talk, we develop modeling procedures that capture aspects of the spatial correlations between voxels and temporal correlations between repeated measures on each subject. Our methods provide a unified framework for the distinct objectives of detecting localized alterations in brain activity and determining associations between different brain regions. We demonstrate the applicability of our model approaches using data from addiction and psychiatric disorders.