Functional data modeling of dynamic PET data

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One major goal of dynamic positron emission tomography (PET) imaging, with particular relevance to the study of mental and neurological disorders, is the estimation of the spatial distribution of specific molecules throughout the brain. Current analysis strategies involve applying parametric models that require fairly strong assumptions, reducing information for each subject and each voxel/region into a single scalar-valued summary, and modeling each subject and each voxel/region sequentially. We will describe extensions of the analysis in three different directions: a nonparametric approach to the modeling of the observed PET data; a functional data analytic (FDA) approach to modeling the impulse response function; and the ability to consider observed PET data from multiple subjects in a single function-on-scalar regression model. We demonstrate the application of this approach and compare the results with those derived from standard parametric approaches.

Keywords: Functional data analysis, PET imaging.