Smoothing Dynamic Positron Emission Tomography Time Courses Using Functional Principal Components

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A functional smoothing approach to the analysis of PET time course data is presented. By borrowing information across space and accounting for this pooling through the use of a non-parametric covariate adjustment, it is possible to smooth the PET time course data thus reducing the noise. A new model for functional data analysis, the Multiplicative Nonparametric Random Effects Model, is introduced to more accurately account for the variation in the data. A locally adaptive bandwidth choice helps to determine the correct amount of smoothing at each time point. This preprocessing step to smooth the data then allows subsequent analysis by methods such as Spectral Analysis to be substantially improved in terms of their mean squared error.