MODELING INCOMPLETE FUNCTIONAL DATA USING WAVELET-BASED FUNCTIONAL MIXED MODELS

J.S. Morris[1], C. Arroyo[2], B.A. Coull[3], L.M. Ryan[3], and S.L. Gortmaker[3]

[1]*University of Texas MD Anderson Cancer Center, Houston, USA*
[2]*Moorehouse School of Medicine, Atlanta, USA*
[3]*Harvard University School of Public Health, Boston, USA*

Email: *jeffmo@mdanderson.org*

Technological innovations have resulted in an increasing number of studies yielding irregular functional data, which are sampled on a fine grid and contain many local features like peaks. Wavelet-based functional mixed models (Morris and Carroll, 2006) can be an effective modeling approach for these data when one wishes to relate these functions to a set of covariates.
The method is able to simultaneously model the functional effects of numerous covariates, while adjusting for between-function correlation using functional random effects of flexible form. Its output consists of posterior samples of all model parameters that can be used for Bayesian inference and prediction. While flexible, this method requires all functions to be completely sampled on a common equally spaced grid, so cannot be applied to incomplete functions that contain missing values at some grid locations. In this talk, we present a method for handling these incomplete functions in the wavelet-based functional mixed model framework. It involves stochastically imputing the missing data from posterior predictive distributions, and borrows strength from the observed measurements within the incomplete functions and from other functions, as well. The imputation uncertainty is appropriately propagated throughout all subsequent inference. We apply this method to accelerometer data taken on a sample of children participating in an intervention study designed to increase physical activity.