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Self-modeling regressions of longitudinal data with autoregressive moving average processes of unknown orders

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Abstract

Functional data with self-modeling structures may arise from biomedical study paradigms where response curves vary across subjects observed over time but are related through parametric transformations of a single latent curve. We present self-modeling regressions for flexible nonparametric modeling of responses measured longitudinally which have a common underlying global time profile. Bayesian adaptive regression splines are used to provide nonparametric estimation of the latent curve and Bayesian model selection for time series by an autoregressive moving average (ARMA) is incorporated. The algorithm is implemented using Markov Chain Monte Carlo, where reversible-jump steps are performed for knot selection in the latent curve estimation and selection of ARMA orders. Our approach combines nonparametric regression and time series estimation to extend the existing self-modeling regression approaches. We illustrate the method using intestinal current measurements collected from a multi-site prospective study to determine conductance of cystic fibrosis transmembrane regulation. We also discuss some of the computational difficulties that arise in application of the method.

Biography

Rhonda Szczesniak completed her Ph.D. at the University of Kentucky in 2007 and became an Assistant Professor of Biostatistics at Cincinnati Children's Hospital Medical Center shortly thereafter. She is currently Director of the Pulmonary Biostatistics Core. Her research areas of interest include functional data analysis, mixture models, and dynamic models in time series analysis. Her current work focuses on development and application of statistical models for functional data from chronic disease studies, including cystic fibrosis, sleep apnea and diabetes.