Found 2 Records

CONTROL ID: 3470041
PRESENTER: Haiyan Liu
PRESENTER (INSTITUTION ONLY): University of Leeds
TITLE: On estimation of the effect lag of predictors and prediction in functional linear model
ABSTRACT BODY:
Abstract Body: We propose a functional linear model to predict a functional response using multiple functional and longitudinal predictors. With the advance
of modern technology, more and more fucntional data are recorded. Examples are electronic health recordings, air pollutants, physiological signals, climatic factors. When modelling functional predictors, an additional challenge is to estimate the effect lags of predictors.

We propose to model the influence of multiple functional predictors on a functional response. Especially, we consider the effect lag of the influence. The coefficient functions are written as the expansion of a basis system (e.g. functional principal components, splines), and the coefficients of the fixed basis functions are estimated via optimizing a penalization criterion. Then time lags are determined by simultaneously searching on a prior designed grid mesh based on minimization of a proposed prediction error criterion. Moreover, mathematical properties of the estimated regression functions and predicted responses are studied.

The performance of the method is evaluated via simulations. The methods are applied to estimate the relationship between air pollution and chronic obstructive pulmonary disease (COPD) hospital admissions in Leeds. Our model revealed that it takes around 3.5 weeks for NO2 concentration to have effect on COPD hospital admissionsand and this effect lasts around 25.5 weeks.
AUTHORS/INSTITUTIONS: H. Liu, G. Aivaliotis, J.J. Houwing-Duistermaat, University of Leeds, Leeds, UNITED KINGDOM|

CONTROL ID: 3470165

PRESENTER: Lijian Yang

PRESENTER (INSTITUTION ONLY): Tsinghua University

TITLE: Prediction of working memory ability based on EEG by functional data analysis

ABSTRACT BODY:

Abstract Body: There is always a demand for fast and accurate algorithms for EEG signal processing. Owing to the high sample rate, EEG signals usually come with a large number of sample points, making it difficult to predict the working memory ability in cognitive research with EEG. Following well-designed experiments, the functional linear model provides a simple framework for regressions involving EEG signal predictors. The use of a data-driven basis in a linear structure naturally extends the standard linear regression model. The proposed approach utilizes B-spline approximation of functional principal components that greatly facilitates implementation. Using LASSO feature selection, critical features have been extracted from eight frontal electrodes, and the R-square of 0.72 indicates rather strong linear association of actual observations and out-of-sample predictions. The data analytics suggest that a multiple functional linear regression model for the predictive relationship between working memory ability and frontal activity of the brain is both feasible and accurate via EEG signal processing.

AUTHORS/INSTITUTIONS: L. Yang, Center for Statistical Science & Department of Industrial Engineering, Tsinghua University, Beijing, CHINA|