European Network for Business and
Industrial Statistics

Contribution ID: **79**   Type: **not specified**

Penalized Spline Regression for Gaussian Function-on-Function Mixture-of-Experts

Wednesday, 18 September 2024 14:00 (20 minutes)

During the past few decades, it has become necessary to develop new tools for exploiting and analysing the ever increasing volume of data. This is one of reason why Functional Data Analysis (FDA) have become a very popular in a constantly growing number of industrial, societal and medical applications. FDA is a branch of statistics that deals with data that can be represented as functions. Unlike traditional data analysis, which focuses on discrete observations, FDA involves analyzing data that is inherently continuous, such as curves, surfaces, and shapes. Regression models with a functional response involving functional covariate, also called "function-on-function", are thus becoming very common. Studying this type of model in the presence of heterogeneous data can be particularly useful in various practical situations. We mainly develop in this work a Mixture-of-Experts designed for fully functional data. As most of the inference approach for models on functional data, we use B-splines basis expansion both for covariates and parameters to have an approximation in finite dimensional space. A regularized inference approach is also proposed, which accurately smoothes functional parameters in order to provide interpretable estimators. Numerical studies on simulated data with different scenarios illustrate the good performance of our method for capturing complex relationship between functional covariates and functional response. The method is finally applied to a real-world data set for comparison to competitors. We illustrate in particular performance of our proposed method on predicting the Quality of user experience of streaming video service based on network quality of service parameters.

Type of presentation

Talk

Classification

Both methodology and application

Keywords

Functional Data Analysis; Mixture-of-Experts; EM algorithm; Ridge regularized estimation

Primary authors: TAMO TCHOMGUI, Jean Steve (Université Lyon2); JACQUES, Julien (Université Lyon2); Mr CHRETIEN, Stéphane (Université Lyon2); Mr FRAYSSE, Guillaume (Orange Innovation); Mr BARRIAC, Vincent (Orange Innovation)

Presenter: TAMO TCHOMGUI, Jean Steve (Université Lyon2)

Session Classification: Functional data

Track Classification: Predictive Analytics