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Multivariate functional response regression, with application to fluorescence spectroscopy in a cervical pre-cancer study [☆]

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Abstract

Many scientific studies measure different types of high-dimensional signals or images from the same subject, producing multivariate functional data. These functional measurements carry different types of information about the scientific process, and a joint analysis that integrates information across them may provide new insights into the [underlying mechanism for the phenomenon under study](#). Motivated by fluorescence spectroscopy data in a cervical pre-cancer study, a multivariate functional response regression model is proposed, which treats multivariate observations as responses and a common set of covariates as predictors. This novel modeling framework simultaneously accounts for correlations between functional variables and potential multi-level structures in data that are induced by experimental design. The model is fitted by performing a two-stage linear transformation—a basis expansion to each functional variable followed by principal component analysis for the concatenated basis coefficients. This transformation effectively reduces the intra- and inter-function correlations and facilitates fast and convenient calculation. A fully Bayesian

[☆]The code that demonstrates how to implement the proposed approach is available as an annex in the electronic version of this manuscript.

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