Spatially Adaptive Functional Linear Regression via Functional Smooth Lasso

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In this paper we consider the setting where the regressor is a functional data such as a curve or an image and the response is a scalar. We propose the "functional smooth lasso" (FSL) approach to simultaneously regularize the roughness and the size of the nonzero portion of the coefficient function estimates in the functional linear regression. An efficient algorithm is developed for computing FSL estimates. The degrees of freedom of FSL is derived and incorporated into the automatic tuning of regularization parameters. Furthermore, we prove the consistency and obtain the convergence rate of FSL estimates. An interesting finding is that the convergence rate depends on the degree of the "smoothness" of the regressors. The efficacy of the proposed method is illustrated via simulation evaluation and real data application.

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