

## Functional regression modeling via regularized Gaussian basis expansions

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**Abstract** We consider the problem of constructing functional regression models for scalar responses and functional predictors, using Gaussian basis functions along with the technique of regularization. An advantage of our regularized Gaussian basis expansions to functional data analysis is that it creates a much more flexible instrument for transforming each individual's observations into functional form. In constructing functional regression models there remains the problem of how to determine the number of basis functions and an appropriate value of a regularization parameter. We present model selection criteria for evaluating models estimated by the method of regularization in the context of functional regression models. The proposed functional regression models are applied to Canadian temperature data. Monte Carlo simulations are conducted to examine the efficiency of our modeling strategies. The simulation results show that the proposed procedure performs well especially in terms of flexibility and stable estimates.

**Keywords** Functional regression modeling · Gaussian basis function · Regularization · Smoothing parameter selection