Optimal designs for discriminating between functional linear models

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Abstract

Improvements in online measuring and monitoring have facilitated an increase in the number of observations that can be taken on each experimental unit in industrial and scientific experiments. Examples include biometry, chemistry, psychology and climatology. It can often be assumed that the data for each run are generated by a smooth underlying function. We are interested in how changes to the levels of the controllable factors influence these functions. Often a semi-parametric model is assumed for the response, with relatively simple polynomial models describing the treatment effects.

Methods are presented for the design of experiments with functional data when the aim is to discriminate between linear models for the treatment effect. We develop an extension of the T-optimality criterion to functional data for discriminating between two competing models. The methodology is motivated by an example from Tribology and assessed via simulation studies to calculate the sensitivity and specificity of the resulting analyses.