

On Nonparametric Functional Data Analysis

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Statistics for Functional Data is a recent field of researches that was popularized by the monographies [5] and [6]. Various statistical questions have been studied with functional data, but the previous literature (see references in [1], [5] and [6]) was concentrated around *parametric* models and methods. Starting with [2] *nonparametric* models have been developed for analyzing functional variables, and the monography [3] presents a wide scope of the literature in this field (including theoretical and applied issues). The main difficulty in developing *nonparametric* statistics for *functional variable* is to control the dimensional effects which are much more important than in standard nonparametric statistics (since functional data are realizations of infinite-dimensional random variables). This control can be made by suitable topological considerations.

The aim of this talk is to present the main ideas going with Nonparametric Functional Data Analysis. After giving precise definitions and discussing the meaning of the words *nonparametric* and *functional variables*, it will be explained how usual kernel smoothing ideas can be adapted to infinite dimensional variables. Then, some among the most important results of [3] will be exposed. The monography [3] is accompanied by a web site [4] containing S+/R routines and applications to various curve datasets. This talk will be illustrated by means of examples extracted of [4].

[1] Bosq, D. (2000) *Linear processes in functions spaces. Theory and Applications*. Lecture Notes in Statistics, **149**, Springer-Verlag, New York.

[2] Ferraty, F. and Vieu, P. (2000). Dimension fractale et estimation de la régression dans des espaces vectoriels semi-normés (in french). *Comptes Rendus Acad. Sci. Paris*, **330**, 403-406.

[3] Ferraty, F. and Vieu, P. (2006). *Nonparametric functional data analysis*. Springer Series in Statistics, New York.

[4] Ferraty, F. and Vieu, P. (2006). NPFDA in practice. Free access on line at <http://www.lsp.ups-tlse.fr/staph/npfda/>

[5] Ramsay, J. and Silverman, B. (1997). *Functional data analysis*. Springer Series in Statistics, New York.

[6] Ramsay, J. and Silverman, B. (2005). *Functional data analysis* (Second edition). Springer Series in Statistics, New York.