Functional principal component analysis for sequential and spatial data

Siegfried Hörmann
Mathematics Department
ULB, Brussels

Data in many fields of science are sampled from processes that can most naturally be described as functional. Examples include growth curves, temperature curves, curves of financial transaction data and patterns of pollution data. Functional data analysis (FDA) is concerned with the statistical analysis of such data.

A problem that we encounter in studying functional data is the "curse of dimensionality". Indeed, functions are intrinsically infinite dimensional objects and it seems evident that tools for reducing dimensionality are even more important than in the multivariate context. A key technique for dimension reduction, which is used in a huge number of applications, is the functional principal component analysis (FPCA).

In this talk we propose a framework that allows to take into account temporal or spatial dependence of functional observations for the FPCA. It turns out that such dependence occurs quite frequently (even in prime examples of FDA literature). We show when FPCA is robust against dependence but we also formulate conditions for the lack thereof.

The talk is based on joint work with Piotr Kokoszka from Utah State University.