中央研究院統計科學研究所
學 術 演 講

講　題：A Bridge between High-dimensional and Functional Data: The Stringing Method

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地　點：中央研究院統計科學研究所6005會議室(環境變遷研究大樓A棟)

Abstract

There is a close relation between high-dimensional data and functional data. For instance, densely observed functional data can be viewed as high-dimensional data endowed with a natural ordering. In this talk, we explore the opposite question whether one can find a proper ordering of high-dimensional data so they can be reordered and viewed as functional data.

Stringing is such a method that takes advantage of the high dimensionality by representing such data as discretized and noisy observations that originate from a hidden smooth stochastic process. It transforms high-dimensional data to functional data so that established techniques from functional data analysis can be applied for further statistical analysis. We illustrate the advantage of the stringing methodology through several data sets. In one of the applications, stringing leads to the development of a new Cox model that accommodates functional covariates.

In the second part of the talk, we extend the stringing approach to align high-dimensional object data. Take the fMRI data as an example, the object is the BOLD time-series and the goal is to align those spatially indexed object data by mapping their spatial locations to a targeted one-dimensional interval so objects that are similar are placed near each other on the new target space. The proposed alignment provides a visualization tool to view these complex object data. Moreover, the aligned data often exhibit certain level of smoothness and can be handled by approaches designed for functional data. We demonstrate how to implement such an alignment for fMRI time series and propose a new concept of path length to study functional connectivity, in addition to a new community detection method. The proposed methods are illustrated by simulations and on a study of the Alzheimer disease.

*Based on joint work with Kun Chen (GE Healthcare), Kehui Chen (U. Pittsburgh), Hans-Georg Mueller (UC Davis), Simeng Qu and Xiao Wang (both from Purdue U.), and Chun-Jui Chen (UC Davis)

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