THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

DEPARTMENT OF APPLIED MATHEMATICS
應 用 數 學 系

Department of Applied Mathematics Seminar

Dr. Wei Luo

Zhejiang University, China

Topic

On non-redundant nonlinear dimension reduction

Date| Time

19 May (Monday) | 14:00 – 15:00 (HK Time)

Venue

N001

Abstract:

Kernel principal component analysis (KPCA; Scholkopf et al., 1998), a popular nonlinear dimension reduction technique, aims at finding a basis of a presumed low-dimensional function space. This causes the redundancy issue that each kernel principal component can be a measurable function of the preceding components, which harms the effectiveness of dimension reduction and leaves the dimension of the reduced data a heuristic choice. In this paper, we formulate the parameter of interest for nonlinear dimension reduction as a small function set that generates the σ-field of the original data, and, using a novel characterization of near conditional mean independence, we propose two sequential dimension reduction methods that address the redundancy issue, have the same level of computational complexity as KPCA, and require more plausible assumptions on the singularity of the original data. Compared with the other nonlinear dimension reduction methods, the proposed methods are applicable to various complex cases with guarantee on both the asymptotic consistency and the smoothness and interpretability of the reduced data. By constructing a measure of exhaustiveness of the reduced data, we also provide consistent order determination for these methods. Some supportive numerical studies are presented at the end.

ALL ARE WELCOME