



香港中文大學統計學系

Department of Statistics  
THE CHINESE UNIVERSITY OF HONG KONG

# SEMINAR

## DEPARTMENT OF STATISTICS

### THE CHINESE UNIVERSITY OF HONG KONG

#### Random effects model-based sufficient dimension reduction for independent clustered data

##### INVITED SPEAKER

Dr. Linh Nghiem  
Lecturer in Statistics  
School of Mathematics & Statistics  
the University of Sydney

##### TIME

Jun 27th, 2025 (Fri) · 10:00 am - 11:00 am

##### VENUE

LSB C3 (G/F) · Lady Shaw Building C3 · CUHK

##### ABSTRACT

Sufficient dimension reduction (SDR) is a popular class of regression methods which aim to find a small number of linear combinations of covariates that capture all the information of the responses i.e., a central subspace. The majority of current methods for SDR focus on the setting of independent observations, while the few techniques that have been developed for clustered data assume the linear transformation is identical across clusters. We introduce random effects SDR, where cluster-specific random effect central subspaces are assumed to follow a distribution on the Grassmann manifold, and the random effects distribution is characterized by a covariance matrix on a tangent space. We incorporate random effect SDR within model-based inverse regression frameworks that can handle mixed types of predictors (time-variant/time-invariant, continuous/binary). A two-stage algorithm is proposed to estimate the overall fixed effect central subspace, and predict the cluster-specific random effect central subspaces. We demonstrate the consistency of the proposed estimators, while simulation studies demonstrate the superior performance of the proposed approach compared to global and cluster-specific SDR approaches. Finally, we apply the method to study the longitudinal association between the life expectancy of women and socioeconomic variables across 117 countries from 1990-2015.

This is a joint work with Francis K.C.Hui at ANU.