



統計科學研究所

INSTITUTE OF  
STATISTICAL SCIENCE



S E M I N A R



S T A T I S T I C S

## Seminar

Title : Deep Learning for Partial Linear Cox Model

Speaker : Prof. Jane-Ling Wang ( 王建玲 教授 )

( Department of Statistics, University of  
California, Davis)

Time : 15:30 ~ 16:30, Wednesday, Apr. 12, 2023

Place : Auditorium, B1F, Institute of Statistical Science

### Abstract

Co-authors: Qixian Zhong, Xiamen Univ. and Jonas Mueller, Clean Lab

While deep learning approaches to survival data have demonstrated empirical success in applications, most of these methods are difficult to interpret and mathematical understanding of them is lacking. This paper studies the partially linear Cox model, where the nonlinear component of the model is implemented using a deep neural network. The proposed approach is flexible and able to circumvent the curse of dimensionality, yet it facilitates interpretability of the effects of treatment covariates on survival. We establish asymptotic theories of maximum partial likelihood estimators and show that our nonparametric deep neural network estimator achieves the minimax optimal rate of convergence (up to a poly-logarithmic factor). Moreover, we prove that the corresponding finite-dimensional estimator for treatment covariate effects is  $\sqrt{n}$ -consistent, asymptotically normal, and attains semiparametric efficiency. Extensive simulation studies and analyses of two real survival datasets show the proposed estimator produces confidence intervals with superior coverage as well as survival time predictions with superior concordance to actual survival times.

※ Online live streaming through Cisco Webex will be available.

※ The tea reception will be held at 15:10.