



School of Data Science

香港城市大學
City University of Hong Kong

SEMINAR SERIES

Individualized Treatment Selection: An Optimal Hypothesis Testing Approach In High-dimensional Models

Date: 16 May 2019 (Thursday)

Time: 4:00pm to 5:00pm

Venue: P7303, 7/F, Yeung Kin Man Academic Building (YEUNG), City University of Hong Kong

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Guest Speaker's profile

Zijian Guo is an Assistant Professor in Department of Statistics, at Rutgers University. He received PhD in Statistics at University of Pennsylvania in 2017 and received the bachelor degree in Mathematics from The Chinese University of Hong Kong in 2012. His main research interests include high-dimensional statistical inference, causal inference and econometrics.

Abstract

The ability to predict individualized treatment effects (ITEs) based on a given patient's profile is essential for personalized medicine. The prediction of ITEs enables the comparison of the effectiveness of two treatment procedures for a specific individual. We propose a hypothesis testing approach to choosing between two available treatments for a given individual in the framework of high-dimensional linear models. The methodological novelty is the development of a testing procedure with the type-I error uniformly controlled for any future high-dimensional observation, while the existing methods can only handle certain specific forms of covariates observation. The procedure is based on a debiased estimator of the ITEs and its asymptotic normality. The asymptotic power of the proposed test is established and the finite sample performance is demonstrated in simulation studies. We introduce the optimality framework of hypothesis testing in high dimensions from both minimaxity and adaptivity perspectives and establish the optimality of the proposed procedure. The proposed method can be extended to conduct statistical inference for general linear contrasts, including both average treatment effect and the prediction problem. The procedure is further illustrated through an analysis of electronic health records data from patients with rheumatoid arthritis.