



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

The Synthetic Instrument

INVITED SPEAKER

Linbo Wang

Associate Professor

Department of Statistical Sciences & Department of Computer
Science

University of Toronto

TIME

Jun 17th, 2025 (Tue) · 2:30 pm - 3:30 pm

VENUE

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

ABSTRACT

In many observational studies, researchers are often interested in studying the effects of multiple exposures on a single outcome. Standard approaches for high-dimensional data such as the lasso assume the associations between the exposures and the outcome are sparse. These methods, however, do not estimate the causal effects in the presence of unmeasured confounding. In this paper, we consider an alternative approach that assumes the causal effects in view are sparse. We show that with sparse causation, the causal effects are identifiable even with unmeasured confounding. At the core of our proposal is a novel device, called the synthetic instrument, that in contrast to standard instrumental variables, can be constructed using the observed exposures directly. We show that under linear structural equation models, the problem of causal effect estimation can be formulated as an ℓ_0 -penalization problem, and hence can be solved efficiently using off-the-shelf software. Simulations show that our approach outperforms state-of-art methods in both low-dimensional and high-dimensional settings. We further illustrate our method using a mouse obesity dataset.