

The Hong Kong Polytechnic University  
Department of Applied Mathematics

## Statistics and Data Science Online Colloquium Series

### Semiparametric Efficient G-estimation with Invalid Instrumental Variables

By

Dr. Zhonghua LIU  
Columbia University

#### Abstract

The instrumental variable method is widely used in the health and social sciences for identification and estimation of causal effects in the presence of potential unmeasured confounding. In order to improve efficiency, multiple instruments are routinely used, leading to concerns about bias due to possible violation of the instrumental variable assumptions. To address this concern, we introduce a new class of g-estimators that are guaranteed to remain consistent and asymptotically normal for the causal effect of interest provided that a set of at least  $\gamma$  out of  $K$  candidate instruments are valid, for  $\gamma < K$  set by the analyst ex ante, without necessarily knowing the identity of the valid and invalid IVs. We provide formal semiparametric efficiency theory supporting our results. Both simulation studies and applications to the UK Biobank data demonstrate the superior empirical performance of our estimators compared to competing methods.

#### Biography

Dr. Zhonghua Liu is currently Assistant Professor in the Department of Biostatistics at Columbia University. He obtained his Ph.D. in Biostatistics from Harvard University in 2015. He worked at Morgan Stanley as a quantitative strategist for fixed income products during 2016-2018. From 2018-2022, He was assistant professor in the Department of Statistics and Actuarial Science at University of Hong Kong.



**Date:** 14 December 2022 (Wednesday)

**Time:** 15:00-16:00 (Hong Kong Standard Time GMT +8)

**Venue:** PQ304 (Hybrid mode)

**Meeting ID:** 952 0313 8558 (Passcode: 1214)

**Speaker:** Dr. Zhonghua Liu, Columbia University

**Host:** Prof. Xingqiu Zhao, The Hong Kong Polytechnic University

**Click to join:**

<https://polyu.zoom.us/j/95203138558?pwd=SGlhWC8vT1pqTVBoeHJJVEF0V3l1UT09>

[Click to join \(Zoom\)](#)

\*\*\* ALL ARE WELCOME \*\*\*