

東海大學統計學系學術演講

時 間：115 年 5 月 12 日（星期二下午 14:10~15:00）

地 點：管理學院新大樓 M242

主講人：黃彥棕 教授（中央研究院 統計科學研究所）

講 題：A Novel Algorithm for Mediation Analysis via Single-Index
Models

Abstract

Mediation analysis is increasingly used to investigate how an exposure Z influences an outcome Y through a set of mediators M . However, most existing methods either rely on parametric assumptions for the mediators and outcome, or are limited to binary exposures and a single mediator. We propose a novel algorithm that accommodates single-index models (SIMs) with non-binary exposures and adjustment for potential confounders, while avoiding parametric assumptions for both mediators and outcome. The proposed estimator proceeds in four steps: (1) regress Y on Z and M using an SIM; (2) predict Y given z_a and M ; (3) regress the predicted Y on Z using another SIM; (4) predict the outcome at z_b . We establish the asymptotic properties of this estimator and evaluate its finite-sample performance through simulation studies. Finally, we demonstrate the practical utility of our method with two applications. The first examines the effect of socioeconomic status on body mass index mediated by DNA methylation of the *FASN* (fatty acid synthase) gene. The second investigates the effect of obesity on glycemic control through triglyceride, fasting glucose, and urine microalbumin.

Keywords: causal inference; mediation analyses; multiple mediators; single-index models

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