



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SPECIAL COLLOQUIUM

Transferring Treatment Effects Across Heterogeneous Sites via Distributional Causal Inference

By

Prof. Annie QU

University of California

Abstract

We propose a novel framework for synthesizing counterfactual treatment group data in a target site by integrating full treatment and control group data from a source site with control group data from the target. Departing from conventional average treatment effect estimation, our approach adopts a distributional causal inference perspective by modeling treatment and control as distinct probability measures on the source and target sites. We formalize the cross-site heterogeneity (effect modification) as a push-forward transformation that maps the joint feature–outcome distribution from the source to the target site. This transformation is learned by aligning the control group distributions between sites using an Optimal Transport–based procedure, and subsequently applied to the source treatment group to generate the synthetic target treatment distribution. Under general regularity conditions, we establish theoretical guarantees for the consistency and asymptotic convergence of the synthetic treatment group data to the true target distribution. Simulation studies across multiple data-generating scenarios and a real-world application to patient derived xenograft data demonstrate that our framework robustly recovers the full distributional properties of treatment effects.

Bio: Annie Qu is Professor at Department of Statistics and Applied Probability, and Founding Director of Center for Statistical Foundations of Artificial Intelligence, University of California, Santa Barbara starting. She received her Ph.D. in Statistics from the Pennsylvania State University in 1998. Qu's research focuses on solving fundamental issues regarding structured and unstructured large-scale data and developing cutting-edge statistical methods and theory in machine learning and algorithms for personalized medicine, text mining, recommender systems, medical imaging data, and network data analyses for complex heterogeneous data. Dr. Qu was a Data Science Founder Professor of Statistics and the Director of the Illinois Statistics Office at the University of Illinois at Urbana-Champaign during her tenure in 2008-2019, and Chancellor's Professor at UC Irvine in 2020-2025. She was a recipient of the NSF Career award from 2004 to 2009. She is a Fellow of the Institute of Mathematical Statistics (IMS), the American Statistical Association, and the American Association for the Advancement of Science. She is also a recipient of IMS Medallion Award and Lecturer in 2024. She serves as Journal of the American Statistical Association Theory and Methods Co-Editor from 2023 to 2025, IMS Program Secretary from 2021 to 2027 and ASA Council of Sections of Governing Board Chair in 2025. She is the recipient of the 2025 Carver Medal of IMS.

Date : 22 June 2026 (Monday)
Time : 3:00p.m.-4:00p.m.
Venue : Room 4503 (near lift 25/26)

All Are Welcome!