香港科技大學
THE HONG KONG
UNIVERSITY OF SCIENCE
AND TECHNOLOGY

土木及環境工程學系
DEPARTMENT OF CIVIL AND
ENVIRONMENTAL ENGINEERING

SEMINAR

CAUSAL INFERENCE FOR MAJOR TRANSPORTATION INTERVENTIONS: ESTIMATION AND INFERENCE VIA TEMPORAL REGRESSION DISCONTINUITY DESIGN IN THE PRESENCE OF INTERFERENCE

Speaker

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Abstract

Major transportation interventions pose substantial challenges for causal evaluation. This is due to lack of randomization, the presence of system-wide interference, the scarcity of suitable control units, and the typically dynamic nature of underlying behavioural processes. In this paper, we develop a framework for estimating the causal impact of major network based interventions in the presence of interference. We introduce a temporal regression discontinuity (TRD) design method that exploits the intervention's implementation date as an exogenous shock, thereby avoiding the need for control units and bypassing the no-interference assumption. We further formalize causal estimands tailored to the TRD approach, providing clear targets for estimation and inference. Our method yields robust, interpretable measures of causal effects in complex transport systems. We present an application of the method to evaluate the the causal impact of the Elizabeth Line opening on urban air quality and pollution in London.

Biography

Dan Graham is Professor of Statistical Modelling in the Department of Civil & Environmental Engineering (DCE) at Imperial College London (ICL), Head of the ICL Centre for Transport Engineering & Modelling (CTEM), and Director of the ICL Transport Strategy Centre (TSC) for Mass Transit Research. He holds a doctoral degree in mathematics from Imperial College London, and his academic career has centred on the development and application of statistical methods to a wide range of problems in transport modelling. Within DCE at imperial, Dan leads the Data Science for Engineering Theme, delivering courses in mathematics, statistics, data science, transport modelling, and economics. He is also a Project Partner of the Data-Centric Engineering Programme at The Alan Turing Institute in London, and a Fellow of both the Institute of Mathematics and its Applications (FIMA) and the Royal Statistical Society (FRSS). Dan leads the Data Science and Statistical Modelling Research Group at Imperial, with a particular emphasis on causal inference. His core research interests include causal inference methods and applications; data-centric engineering; statistical modelling for performance analytics; mathematical modelling in operations, economics and planning; and resilience, risk, and safety analysis.

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