L'inférence causale en présence de dépendance et de structure de réseau
« Atelier sur l'ajustement causal en présence de la dépendance spatiale »
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Causal Inference in the Presence of Dependence and Network Structure
"Workshop on Causal adjustment in the presence of spatial dependence"
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Controlling for the effects of preferential sampling in spatio-temporal networks

Joe Watson*

watsonjoe8@gmail.com

Human health and welfare may both be adversely affected by the burdens imposed over large geographical domains by hazardous processes such as temperature and air pollution. The changing climate and increasing size of the Global human population make these potential effects progressively more acute as time goes on, along with the need to monitor and control these processes through mitigation strategies and regulatory policy. Fundamental to the development of such strategies and policies are good data. That has led to the establishment of networks of monitoring sites for these processes.

However, these networks can evolve over time and eventually yield unrepresentative data. Estimates of model parameters for those processes may then become biased, leading to the underestimation of the health and welfare effects as well as an overestimation of the degree of noncompliance.

The talk presents a new and more comprehensive approach for addressing the problem, one that entails jointly modelling and fitting a (Gaussian) environmental process and (binary) selection process where the number of sites is exceptionally large, ruling out use of standard Bayesian computational methods for model fitting. The method relies on the integrated nested Laplace approximation. Within that framework, the selection model includes a number of important features: retention (once selected, sites tend to remain in); repulsion (new sites will not placed near established ones); noncompliance detection (sites tend to be placed where environmental hazards are large). A model residual term picks up unknown selection factors. We will describe a case study where mitigation measures in the United Kingdom led to a sharp decline in ambient levels of British Smoke (BS) with a resulting closure of a large number of monitoring stations. The analysis shows these closures were made in a preferential way and thus standard modeling approaches suffer from parameter estimation bias. The potential consequences of this are addressed above.

*Department of Statistics, University of British Columbia, 3182 Earth Sciences Building, Vancouver, BC V6T 1Z4, CANADA