Statistics Seminar

Department of Mathematics and Statistics

DATE:	Thursday, September 19, 2024
TIME:	1:15pm – 2:15pm
LOCATION:	WH 100E
SPEAKER:	Dan Kowal, Cornell University
TITLE:	Monte Carlo inference for semiparametric Bayesian regression

Abstract

Data transformations are essential for broad applicability of parametric regression models. However, for Bayesian analysis, joint inference of the transformation and model parameters typically involves restrictive parametric transformations or nonparametric representations that are computationally inefficient and cumbersome for implementation and theoretical analysis, which limits their usability in practice. We introduce a simple, general, and efficient strategy for joint posterior inference of an unknown transformation and all regression model parameters. The proposed approach directly targets the posterior distribution of the transformation by linking it with the marginal distributions of the independent and dependent variables, and then deploys a Bayesian nonparametric model via the Bayesian bootstrap. Crucially, this approach delivers (1) joint posterior consistency under general conditions, including multiple model misspecifications, and (2) efficient Monte Carlo (not Markov chain Monte Carlo) inference for the transformation and all parameters for important special cases. These tools apply across a variety of data domains, including real-valued, positive, and compactly- supported data. Simulation studies and an empirical application demonstrate the effectiveness and efficiency of this strategy for semiparametric Bayesian analysis with linear models, quantile regression, and Gaussian processes. The R package SeBR is available on CRAN. Paper: https://doi.org/10.1080/01621459.2024.2395586 Software documentation: https://drkowal.github.io/SeBR/

Bio

Dan Kowal is Associate Professor in the Department of Statistics and Data Science at Cornell University. His research interests include Bayesian models and algorithms for dependent data, synthesis and imputation of mixed data, and issues related to statistical interpretability and equity. Dr. Kowal’s research has been recognized with a Young Investigator Award from the Army Research Office, the inaugural Blackwell-Rosenbluth Award, and multiple paper and presentation awards.