2020년 제 2회 통계세미나

고려대학교 통계연구소와 BK21 통계학교육연구팀은 다음과 같이 공동으로 세미나를 개최하오니 많은 참여 바랍니다.

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Causal Rule Ensemble: Interpretable Inference of Heterogeneous Treatment Effects

<Abstract>

In environmental epidemiology, it is critically important to identify subpopulations that are most vulnerable to the adverse effects of air pollution so we can develop targeted interventions. In recent years, there have been many methodological developments for addressing heterogeneity of treatment effects in causal inference. A common approach is to estimate the conditional average treatment effect (CATE) for a pre-specified covariate set. However, this approach does not provide an easy-to-interpret tool for identifying susceptible subpopulations or discover new subpopulations that are not defined a priori by the researchers. In this paper, we propose a novel causal rule ensemble (CRE) method with two features simultaneously: 1) ensuring interpretability by revealing heterogeneous treatment effect structures in terms of decision rules and 2) providing CATE estimates with high statistical precision similar to other machine learning algorithms. We provide theoretical results that guarantee consistency of the estimated causal effects for the newly discovered causal rules. Furthermore, via simulations, we show that the CRE method has competitive performance on its ability to discover subpopulations and then accurately estimate the causal effects. We also develop a new sensitivity analysis method that examine robustness to unmeasured confounding bias. Lastly, we apply the CRE method to the study of the effects of long-term exposure to air pollution on the 5-year mortality rate of the New England Medicare-enrolled population in United States.

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