



北京理工大学

数学与统计学院学术报告

A robust fusion-extraction procedure with summary statistics in the presence of biased sources

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时间: 2023年10月25日, 15:30-16:30

地点: 北京理工大学良乡校区文萃楼D703

摘要: Information from multiple data sources is increasingly available. However, some data sources may produce biased estimates due to biased sampling, data corruption, or model misspecification. This calls for robust data combination methods with biased sources. In this paper, a robust data fusion-extraction method is proposed. In contrast to existing methods, the proposed method can be applied to the important case where researchers have no knowledge of which data sources are unbiased. The proposed estimator is easy to compute and only employs summary statistics, and hence can be applied to many different fields, e.g., meta-analysis, Mendelian randomization, and distributed systems. The proposed estimator is consistent even if many data sources are biased and is asymptotically equivalent to the oracle estimator that only uses unbiased data. Asymptotic normality of the proposed estimator is also established. In contrast to the existing meta-analysis methods, the theoretical properties are guaranteed even if the number of data sources and the dimension of the parameter diverges as the sample size increases. Furthermore, the proposed method provides a consistent selection for unbiased data sources with probability approaching one. Simulation studies demonstrate the efficiency and robustness of the proposed method empirically. The proposed method is applied to a meta-analysis data set to evaluate the surgical treatment for moderate periodontal disease and to a Mendelian randomization data set to study the risk factors of head and neck cancer.

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