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Asymptotic theory for differentially private generalized \( \beta \)-models with parameters increasing. (English) Zbl 07214271

Summary: Modelling edge weights play a crucial role in the analysis of network data, which reveals the extent of relationships among individuals. Due to the diversity of weight information, sharing these data has become a complicated challenge in a privacy-preserving way. In this paper, we consider the case of the non-denoising process to achieve the trade-off between privacy and weight information in the generalized \( \beta \)-model. Under the edge differential privacy with a discrete Laplace mechanism, the Z-estimators from estimating equations for the model parameters are shown to be consistent and asymptotically normally distributed. The simulations and a real data example are given to further support the theoretical results.

MSC:
62F12 Asymptotic properties of parametric estimators
05C80 Random graphs (graph-theoretic aspects)
62E20 Asymptotic distribution theory in statistics
62F10 Point estimation

Keywords:
\( \beta \)-model; discrete Laplace distribution; edge differential privacy; network data; Z-estimators

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