Selling Data at an Auction under Privacy Constraints

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Abstract: Private data query combines mechanism design with privacy protection to produce aggregated statistics from privately-owned data records. The problem arises in a data marketplace where data owners have personalised privacy requirements and private data valuations. We focus on the case when the data owners are *single-minded*, i.e., they are willing to release their data only if the data broker guarantees to meet their announced privacy requirements. For a data broker who wants to purchase data from such data owners, we propose the *SingleMindedQuery (SMQ)* mechanism, which uses a reverse auction to select data owners and determine compensations. SMQ satisfies interim incentive compatibility, individual rationality, and budget feasibility. Moreover, it uses *purchased privacy expectation maximization* as a principle to produce accurate outputs for commonly-used queries such as counting, median and linear predictor. The effectiveness of our method is empirically validated by a series of experiments.

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