

# Minimax Rate for Multivariate Data Estimation Under Componentwise Local Differential Privacy Constraints

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## **Title:**

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## **Abstract:**

Let us consider a sampling of i.i.d. data with law  $X$  valued in  $R^d$ ,  $d \geq 2$ . We study the problem of estimating the law of  $X$  subject to a componentwise local differential privacy (CLDP) constraint. In this framework, the statistician cannot access the raw data  $X_1, \dots, X_n$ , which are replaced by public values  $Z_1, \dots, Z_n$ . These public values are randomizations of the raw data. Under the CLDP constraint, each component of the private data is made public through a separate privacy channel. This allows for varying levels of privacy protection for different components or for the privatization of each component by different entities, each with their own distinct privacy policies. It also covers the practical situations where it is impossible to privatize jointly all the components of the raw data. Under this CLDP constraint, we study nonparametric density and covariance estimation, providing upper and lower bounds that match up to constant factors, as well as an associated data-driven adaptive procedure.