On Differentially Private Counting on Trees

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Badih Ghazi, Pritish Kamath, Ravi Kumar, Pasin Manurangsi and Kewen Wu

Abstract: We study the problem of performing counting queries at different levels in hierarchical structures while preserving individuals' privacy. Motivated by applications, we propose a new error measure for this problem by considering a combination of multiplicative and additive approximation to the query results. We examine known mechanisms in differential privacy (DP) and prove their optimality, under this measure, in the pure-DP setting. In the approximate-DP setting, we design new algorithms achieving significant improvements over known ones.

Presenter: MANURANGSI, Pasin

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