Title : Approximating Profile Maximum Likelihood Efficiently: New Bounds on the Bethe Permanent

Speaker : Moses Charikar, Stanford University, California

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Time : 2:00 PM

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Abstract : Symmetric properties of distributions arise in multiple settings. For each of these, separate estimators and analysis techniques have been developed. Recently, Orlitsky et al showed that a single estimator that maximizes profile maximum likelihood (PML) is sample competitive for all symmetric properties. Further, they showed that even a $2^{n^{1-delta}}$-approximate maximizer of the PML objective can serve as such a universal plug-in estimator. (Here n is the size of the sample). Unfortunately, no polynomial time computable PML estimator with such an approximation guarantee was known. We provide the first such estimator and show how to compute it in time nearly linear in n. The PML objective is related to the permanent of a certain Vandermonde matrix. A surprising connection between the convex relaxation we introduce and the Bethe free energy approximation originating in statistical physics leads to new bounds on the Bethe permanent of non-negative matrices.