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Title: **The Menu-Size of Approximately Optimal Auctions**

Abstract: We consider a monopolist who wishes to sell n goods to a single additive buyer, where the buyer's valuations for the goods are drawn according to independent distributions. It is well known that — unlike in the single item case — the revenue-optimal auction (a pricing scheme) may be complex, sometimes requiring a continuum of menu entries. It is also known that simple auctions with a finite bounded number of menu entries can extract a constant fraction of the optimal revenue, as well as that for the case of bounded distributions it is possible to extract an arbitrarily high fraction of the optimal revenue via a finite bounded menu size. Nonetheless, the question of the possibility of extracting an arbitrarily high fraction of the optimal revenue via a finite menu size, when the valuation distributions possibly have unbounded support (or via a finite bounded menu size when the support of the distributions is bounded by an unknown bound), remained open since the seminal paper of Hart and Nisan (2013), and so has the question of any lower-bound on the menu-size that suffices for extracting an arbitrarily high fraction of the optimal revenue when selling a fixed number of goods, even for two goods and even for i.i.d. bounded distributions.

In this talk, we resolve both of these questions. We first show that for every n and for every $\varepsilon>0$, there exists a menu-size bound $C=C(n,\varepsilon)$ such that auctions of menu size at most C suffice for extracting a $(1-\varepsilon)$ fraction of the optimal revenue from any valuation distributions, and give an upper bound on $C(n,\varepsilon)$, even when the valuation distributions are unbounded and nonidentical. We then proceed to giving two lower bounds, which hold even for bounded i.i.d. distributions: one on the dependence on n when $\varepsilon=1/n$ and n grows large, and the other on the dependence on ε when n is fixed and ε grows small. Finally, we apply these upper and lower bounds to derive results regarding the deterministic communication complexity required to run an auction that achieves such an approximation.

Based on:

1. The Menu-Size Complexity of Revenue Approximation --- joint work with Moshe Babaioff and Noam Nisan, STOC 2017

2. Bounding the Menu-Size of Approximately Optimal Auctions via Optimal-Transport Duality, STOC 2018