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Improved Truthful Mechanisms for Combinatorial Auctions

A longstanding open problem in Algorithmic Mechanism Design is to design computationally efficient truthful mechanisms for (approximately) maximizing welfare in combinatorial auctions with submodular/subadditive bidders. This problem has been studied extensively since the first mechanisms by Dobzinski, Nisan, and Schapira [STOC'05, STOC'06], culminating in an $O(\sqrt{\log m})$-approximation for submodular and an $O(\log m \cdot \log\log m)$-approximation for subadditive bidders, where m is the number of items. We present computationally-efficient truthful mechanisms with exponentially improved approximation ratios: an $O((\log\log m)^3)$-approximation for subadditive and an $O((\log\log m)^2)$-approximation for submodular bidders.

Based on joint works with Sepehr Assadi and Thomas Kesselheim [FOCS'19, SODA'21].