Efficient Empirical Revenue Maximization in Single-Parameter Auction Environments

Abstract:
We present a polynomial-time algorithm that, given samples from the unknown valuation distribution of each bidder, learns an auction that approximately maximizes the auctioneer's revenue in a variety of single-parameter auction environments including matroid environments, position environments, and the public project environment. The valuation distributions may be arbitrary bounded distributions (in particular, they may be irregular, and may differ for the various bidders), thus resolving a problem left open by previous papers. The analysis uses basic tools, is performed in its entirety in value-space, and simplifies the analysis of previously known results for special cases. Furthermore, the analysis extends to certain single-parameter auction environments where precise revenue maximization is known to be intractable, such as knapsack environments. Joint work with Noam Nisan.