How Computer Science Informs Modern Auction Design

Tim Roughgarden

Columbia University, Department of Computer Science, New York, USA
tr@cs.columbia.edu

—— **Abstract** ——

Over the last twenty years, computer science has relied on concepts borrowed from game theory and economics to reason about applications ranging from internet routing to real-time auctions for online advertising. More recently, ideas have increasingly flowed in the opposite direction, with concepts and techniques from computer science beginning to influence economic theory and practice.

In this lecture, I will illustrate this point with a detailed case study of the 2016-2017 Federal Communications Commission incentive auction for repurposing wireless spectrum. Computer science techniques, ranging from algorithms for NP-hard problems to nondeterministic communication complexity, have played a critical role both in the design of the reverse auction (with the government procuring existing licenses from television broadcasters) and in the analysis of the forward auction (when the procured licenses sell to the highest bidder).