Research Highlight:
Equivalence of Stochastic and Deterministic Mechanisms

Work of Professor SUN Yeneng

The most common economic activity in our daily life is "buy and sell". When a seller has N objects to sell and is uncertain about the valuations of M buyers, a fundamental question is whether there exists an optimal mechanism that maximizes the seller's expected revenue. Roger Myerson (1981) solved this problem for N = 1. His solution "the *single* object should be allocated *deterministically* to the bidder with the highest virtual value in an auction" won him the 2007 Nobel Prize in Economics.

Little is known about optimal mechanisms with *multiple* objects. The 2017 paper of Daskalakis-Deckelbaum-Tzamos (mentioned in the 2018 Nevanlinna Prize Citation of Daskalakis) provided some characterizations for the *single* buyer case that involve stochastic mechanisms. It also means that the optimality of deterministic mechanisms fails in general for the case of multiple objects even with a single buyer. However, for the case of multiple objects and multiple buyers (M ≥ 2 and N ≥ 2), Prof Sun and his coauthors proved a mechanism equivalence result that implies the optimality of deterministic mechanisms. In particular, any mechanism, including the optimal mechanism, can be implemented using a deterministic mechanism and nothing can be gained from designing more intricate mechanisms with possibly more complex randomization in the allocation rule.

References:

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