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CENTER FOR MATHEMATICS

UNIVERSITÄT BONN

Conference

"14th Day on Computational Game Theory"

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organized by
Thomas Kesselheim, Laura Vargas Koch

Abstracts

Michal Feldman (Tel-Aviv University)

Ambiguous contracts

Abstract: In this work we explore the deliberate infusion of ambiguity into the design of contracts. We show that when the agent is ambiguity-averse and chooses an action that maximizes their max-min utility, then the principal can strictly gain from using an ambiguous contract. We provide insights into the structure of optimal contracts, and establish that optimal ambiguous contracts are composed of simple contracts. We also provide a geometric characterization of ambiguity-proof classes of contracts. Finally, we show that when the agent considers mixed strategies, then there is no advantage in using an ambiguous contract.

László A. Végh (London School of Economics and Political Science)

Approximating Competitive Equilibrium by Nash Welfare

Abstract: We explore the relationship between two popular concepts on allocating divisible items: competitive equilibrium (CE) and allocations with maximum Nash welfare, i.e., allocations where the weighted geometric mean of the utilities is maximal. When agents have homogeneous concave utility functions, these two concepts coincide: the classical Eisenberg-Gale convex program that maximizes Nash welfare over feasible allocations yields a competitive equilibrium. However, these two concepts diverge for non-homogeneous utilities. From a computational perspective, maximizing Nash welfare amounts to solving a convex program for any concave utility functions, computing CE becomes PPAD-hard already for separable piecewise linear concave (SPLC) utilities.
We introduce the concept of Gale-substitute utility functions, an analogue of the weak gross substitutes (WGS) property for the so-called Gale demand system. For Gale-substitutes utilities, we show that any allocation maximizing Nash welfare provides an approximate-CE with surprisingly strong guarantees, where every agent gets at least half the maximum utility they can get at any CE, and is approximately envy-free. Gale-substitutes include examples of utilities where computing CE is PPAD hard: in particular, all separable concave utilities, and the previously studied non-separable class of Leontief-free utilities. We introduce a new, general class of utility functions called generalized network utilities based on the generalized flow model; this class includes SPLC and Leontief-free utilities. We show that all such utilities are Gale-substitutes.

Conversely, although some agents may get much higher utility at a Nash welfare maximizing allocation than at a CE, we show a price of anarchy type result: for general concave utilities, every CE achieves at least 0.69 fraction of the maximum Nash welfare, and this factor is tight.
This is joint work with Jugal Garg and Yixin Tao.
