15th Days on Computational Game Theory

Abstracts invited speakers

Laura Vargas Koch:

Mathematics in Traffic Modeling: Nash Flows over Time
In traffic planning, traffic simulations are widely used. However, effective practical traffic simulations require good mathematical models as a foundation, and one such model is Nash flows over time. Traffic is not a centrally controlled system. Instead, each participant in traffic decides individually which route is best for them. When all participants do this, so-called equilibrium states emerge. In our research, we focus on these equilibria and their properties. Unlike static, classical models, the unique aspect of Nash flows over time is that temporal changes can be depicted. This means that a flow, which models traffic, moves through the network over time, and the situation in the network can dynamically change. In this presentation, we will learn about the model of Nash flows over time, understand its close connection to the traffic simulation software MATSim and see what properties of the equilibria have already been understood, and what questions are still open.

Georgios Amanatidis:

Pushing the Frontier on Approximate EFX Allocations
We study the problem of allocating a set of indivisible goods to a set of agents with additive valuation functions, aiming to achieve approximate envy-freeness up to any good (a-EFX). The state-of-the-art results on the problem include that (exact) EFX allocations exist when (a) there are at most three agents, or (b) the agents' valuation functions can take at most two values, or (c) the agents' valuation functions can be represented via a graph. For a-EFX, it is known that a 0.618-EFX allocation exists for any number of agents with additive valuation functions. In this paper, we show that 2/3-EFX allocations exist when (a) there are at most seven agents, (b) the agents' valuation functions can take at most three values, or (c) the agents' valuation functions can be represented via a multigraph. Our results can be interpreted in two ways. First, by relaxing the notion of EFX to 2/3-EFX, we obtain existence results for strict generalizations of the settings for which exact EFX allocations are known to exist. Secondly, by imposing restrictions on the setting, we manage to beat the barrier of 0.618 and achieve an approximation guarantee of 2/3. Therefore, our results push the frontier of existence and computation of approximate EFX allocations, and provide insights into the challenges of settling the existence of exact EFX allocations.

Based on joint work with Aris Filos-Ratsikas and Alkmini Sgouritsa.