

Introduction to the Special Issue for the Symposium on Algorithmic Game Theory (SAGT) 2024

The 17th International Symposium on Algorithmic Game Theory (SAGT 2024) was held in Amsterdam, The Netherlands, on September 3–6, 2024. SAGT provides a forum for research at the interface of computer science, economics, and game theory, including algorithmic mechanism design, computational social choice, equilibria and their efficiency, and matching and allocation problems. The authors of a selection of papers presented at SAGT 2024 were invited for submission to this special issue of *ACM Transactions on Economics and Computation*. The six papers collected here were substantially revised and extended, and refereed according to the journal’s standard process. Together, they illustrate the breadth of algorithmic game theory, combining structural and complexity-theoretic analysis with the design and evaluation of strategic systems.

The first article, *Leveraging Optimal Transport to Design Optimal Mechanisms for the Facility Location Problem*, by Gennaro Auricchio and Jie Zhang, studies the k -facility location problem on the line in a Bayesian mechanism design setting, focusing on truthful percentile mechanisms. By relating the problem to projection in Wasserstein space, the authors characterize the asymptotic Bayesian approximation ratio of these mechanisms, establish convergence guarantees, and identify optimal percentile mechanisms tailored to the distribution of agents’ locations. The article additionally treats percentile vectors with entries at the boundary of the unit interval and extends the analysis from social cost to ℓ_p -norm and maximum-cost objectives.

In *Price of Anarchy in Paving Matroid Congestion Games*, Bainian Hao and Carla Michini study how matroid structure limits the inefficiency of pure Nash equilibria in symmetric congestion games. They derive upper bounds for k -uniform and paving matroids under general classes of delay functions, as well as refined bounds for affine delays. Their analysis uses exchange flows between an equilibrium and a social optimum, thereby connecting matroid basis exchange with the price of anarchy. The resulting bounds show that the combinatorial structure of paving matroids can substantially restrict equilibrium inefficiency.

The third contribution, *Discrete Single-Parameter Optimal Auction Design*, by Yiannis Giannakopoulos and Johannes Hahn, develops a discrete counterpart to central aspects of Myerson’s theory of optimal auctions. Using linear-programming duality and polyhedral methods, the authors derive virtual-welfare characterizations of revenue-optimal auctions for finite-support value distributions and show that deterministic dominant-strategy incentive-compatible auctions are optimal

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even against the wider class of Bayesian incentive-compatible mechanisms. They then extend the framework to general convex single-parameter environments and objectives combining revenue and social welfare, using KKT conditions to characterize generalized virtual-welfare maximization. The article also gives an application to capacitated flow auctions on trees.

The informational resources needed to sustain strategic behavior is considered next in *Playing Repeated Games with Sublinear Randomness*, by Farid Arthaud. The article studies the entropy required for Nash equilibria in finitely repeated normal-form games when randomization is scarce or costly. It gives a complete characterization of games whose repeated versions admit constant-randomness equilibria and proves a zero-one law: a repeated game either admits equilibria using $O(1)$ randomness or every equilibrium requires randomness growing linearly with the number of repetitions. The paper further characterizes attainable payoff profiles and investigates settings with observable mixed strategies and with bounded randomness for only a subset of players.

In *Structural and Algorithmic Results for Stable Cycles and Partitions in the Roommates Problem*, Frederik Glitzner and David Manlove investigate stable partitions, a solution concept that exists even when an instance of Stable Roommates has no stable matching. The authors establish new structural results for stable cycles and partitions, develop efficient enumeration algorithms, and show how stable partitions correspond to stable half-matchings. They also adapt several fairness and optimality criteria from stable matchings to stable partitions, identifying the tractable and intractable variants and giving approximation results for some of the latter.

Finally, *Estimating the Expected Social Welfare and Cost of Random Serial Dictatorship*, by Ioannis Caragiannis and Sebastian Homrighausen, addresses the evaluation of random serial dictatorship in assignment problems. The authors consider both value-based and metric-cost settings and show that sampling a relatively small number of priority orderings is sufficient to approximate, respectively, the expected social welfare and expected social cost of random serial dictatorship. These results provide computationally practical estimators despite the #P-hardness of exact evaluation.

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