Guest Editorial
Introduction to the Special Section on Economics of Modern Networks

MANY modern networks are becoming increasingly heterogeneous, dynamic, and complex. The need for smart and self-organizing network designs has become a central research issue in a variety of applications and scenarios. Proper economic mechanism design will go hand-in-hand with technology advances in solving many complex design and operation issues in these modern networks. Such economic consideration will have fundamental impacts on a wide range of modern networks, such as the Internet, wireless networks, energy networks, transportation networks, social networks, and supply chain networks.

The special section of "Economics of Modern Networks" focused on the state-of-art economic modeling and analysis results on networks. Thanks to the extensive efforts of the reviewers and the great support from the Editor-in-Chief, Dr. Dapeng Oliver Wu, we were able to accept 5 contributed articles covering several important topics, from the theoretical framework of distributed mechanism design to the defense mechanism for modern networks to the applications in transportation networks and 5G networks. A brief review follows:

Heydaribeni and Anastasopoulos in "Distributed mechanism design for network resource allocation problems" considered a distributed mechanism design framework, where message transmission can only be performed locally so that the mechanism allocation/tax functions can be calculated in a decentralized manner. They proposed two distributed mechanisms for network utility maximization problems, which involve private and public goods with competition and cooperation between agents.

Many networks systems, such as Internet, smart grids, transportation networks, social networks, are constantly under the threat of malicious attackers. Guan *et al.* in "Colonel Blotto games in network systems: Models, strategies, and applications" formulated a networked Colonel Blotto game for the attack-defense strategy, where the attackers and defenders allocate the limited resources on each node. They further proposed a co-evolution based algorithm for obtaining the practical action sets as well as achieving the mixed-strategy Nash equilibrium.

In "Investment in EV charging spots for parking," Badia, Berry and Wei considered two models regarding how to make investment decisions for electrical vehicle charging stations on existing parking spots. They first analyzed the competitive market where two firms who compete over installing stations under government set mandates or subsidies. They then studied a system operator who faces uncertainty on the size of the EV market.

In "Incentive mechanism based cooperative spectrum sharing for OFDM cognitive IoT network," Lu *et al.* used contract theory to design the incentive mechanism in OFDM-based cognitive IoT network with incomplete information. They proposed both the optimal contract design that maximizes the social welfare and heuristic contact design with a finite PUs' budget.

Finally, Liu, Tang and Wang in "Joint incentive and resource allocation design for user provided networks under 5G integrated access and Backhaul networks" considered the user-provided network formed by device-to-device links under 5G integrated access and backhaul networks. They proposed a novel joint incentive and resource allocation design for such networks.

In summary, the collected articles not only offer innovative application scenarios but also shed light on the underlying principles of economic mechanism design for modern networks. We hope that this timely special section will trigger more future work in the emerging area.

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