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EDITORIAL

IEEE ACCESS SPECIAL SECTION EDITORIAL: SOCIALLY ENABLED NETWORKING AND COMPUTING

This Special Section in IEEE ACCESS entitled ''Socially enabled networking and computing'' was motivated by the following observation: in recent years, mobile social networks, (i.e. the networks of individuals with similar interests connected to each other through their mobile devices) is emerging as a source of information to achieve high efficiency communication and networking with better performance on key metrics of lower delay, better coverage, higher data rate, etc. Mobile devices are now powerful enough to form cooperative groups, assisting each other by sharing communication and computation resources. In such a scenario, critical technical problems should be solved to realize these potential benefits, i.e., how to efficiently utilize the computing and communication capabilities among these smart devices, and how to facilitate mobile computing for human-computer interaction in which a computer is expected to be mobile in the network during normal usage. In addition to these technical challenges, another major problem is to understand human behaviors and further utilize them in the mobile social networks to facilitate the benefits of considering human's social relations and behaviors in mobile computing, communication, and networking.

This Special Section in IEEE ACCESS focuses on the emerging topics of mobile social networks and corresponding applications with emphasis on networking and computing. The response of the research community to the Call for Papers was very intriguing. We received a total of 18 submissions, out of which we selected the following 9 works to be published in this Special Section.

The first article, titled ''Mobile social networking under side-channel attacks: Practical security challenges,'' by A. Ometov, *et al.*, highlights how the growth of new mobile-friendly applications and their proliferation within the mobile social networks (MSN) is beginning to pose serious challenges to information security in radio mobile environments. Such social interactions can be monitored by malicious users for extracting sensitive and private information. In particular, it analyzes possible malicious attacks (named side-channel attacks –SCAs) by utilizing off-the-shelf equipment to extract sensitive information from a group of users, which exploit their social relationships to share data over the proximity-based links. Based on these investigations, it further offers a guideline that users may follow to decrease the levels of risk for their personal devices.

The second article, titled ''Transitivity demolition and the fall of social networks,'' by H. Nguyen, *et al.*, studies crucial elements of a complex network, namely its nodes and connections, which play a key role in maintaining the network's structure and function under unexpected structural perturbations of nodes and edges removal. Specifically, vital nodes and edges are identified whose failure (either random or intentional) will break the most number of connected triples (or triangles) in the network. The analysis is formulated under multiple optimization problems, and efficient approximation algorithms are proposed to guarantee an (1-1/e)-approximate optimum with the same time complexity as the best triangle counting and listing algorithm on power-law networks.

The third article, titled ''Exploiting social Internet of Things features in cognitive radio'', by M. Nitti, *et al.*, investigates the potential of integrating social networking concepts into Internet of Things solutions. In particular, it proposes the utilization of the Social Internet of Things (SIoT) paradigm for the sensing of the channel status in order to implement cognitive radio (CR) solutions. According to this, objects are capable of establishing social relationships in an autonomous way to enable a faster and more trustworthy service discovery and for delivering information related to the channels usage. Finally, it demonstrates that the synergy of SIoT paradigm along with the CR technology improves the network performance by efficiently exploiting the spectrum and by reducing the interference probability.

The fourth article, titled ''Performance characterization of machine-to-machine networks with energy harvesting and social-aware relays,'' by S. Huang, *et al.*, investigates a large-scale machine-to-machine (M2M) network architecture that incorporates energy harvesting and social-aware relays. The relays are powered by harvested radio frequency energy and implement a simultaneous wireless information and power transfer strategy. They are conversant only with a subset of the sources based on social metrics and only assist the data transfer of those sources. To this end, two different relay selection strategies, social-aware random relay selection and social-aware best relay selection, are proposed and analyzed. Within comparison to the situation without social awareness,

the social awareness solution is found to improve the performance in certain situations.

In the fifth article, titled "A technological perspective on information cascades via social learning," by F. Rosas, *et al.*, based on social learning, an analytical knowledge originated in social science, the well-known phenomenon of information cascade is reexamined, where rational agents can ignore personal knowledge in order to follow a predominant social behavior triggered by earlier decisions made by peers. Moreover, the cascade behavior is investigated from a communication theoretic perspective, interpreting social learning as a distributed data processing scheme. This perspective enables the development of a novel framework, which allows a characterization of the conditions that trigger information cascades and trace their impact on the accuracy of the collective inference. Finally, potential applications and examples of information cascade have been presented under various cyber technological scenarios, which illustrates the prolific interplay between communication technology and computational social science.

The sixth article, titled "An evolutionary game for user access mode selection in fog radio access networks," by S. Yan, *et al.*, focuses on fog radio access networks (F-RANs), which incorporates fog computing, edge storage and centralized cloud computing into radio access networks, where fog computing extends cloud computing based services to the edge of the network. In the article, users are characterized in order to select an appropriate communication mode in F-RANs. To this end, an evolutionary game theory approach is adopted and a dynamic mode selection algorithm is proposed for F-RANs, in which the competition among the groups of potential users is formulated as a dynamic evolutionary game, and the game is solved by an evolutionary equilibrium. Stochastic geometry is used to derive the proposals' payoff expressions for both the fog access points and device-to-device users by considering node location, cache sizes, as well as the delay cost. The results show that the evolutionary game-based access mode selection algorithm has a better payoff than the benchmark max rate-based algorithm.

The seventh article, titled "4-DMWM approach for caching based optimal D2D pairing and channel allocation: Centralized and distributed algorithm design," by L. Miao, *et al.*, jointly considers the resource allocation, cached contents, and distance between two devices for the optimal device pairing problem in centralized and distributed cases. The joint optimization problem of device-to-device (D2D) caching with channel allocation is formulated as a weighted four-uniform hypergraph model. The optimal solution for the problem is 4-D maximum weighted matching (4-DMWM), and distributed algorithms are also designed for the caching problem in both synchronous and asynchronous cases.

The eighth article, titled "PAC algorithms for detecting Nash equilibrium play in social networks: From Twitter to energy markets," by W. Hoiles, *et al.*, studies the detection of agents whose responses satisfy equilibrium play for predicting the dynamics of information propagation in social networks. Using Afriat's theorem of revealed preferences, a non-parametric detection test is constructed to detect if the responses of a group of agents is consistent with play from the Nash equilibrium of a concave potential game. The proposed detection tests and learning algorithm are applied to real-world data sets from the Twitter social network and the Ontario power grid.

The ninth article, titled "Modeling for information diffusion in online social networks via hydrodynamics," by Y. Hu, *et al.*, exploits a hydrodynamic model to describe the spreading process of the information in online social networks. By using the proposed hydrodynamic information diffusion prediction model (hydro-IDP), the spreading process of the information can be described on both temporal and spatial perspectives. It is also helpful in extracting the characteristics of information diffusion (e.g., the information popularity, the user influence, and the diffusivity of social platform). The high accuracy of the model has illustrated that the proposed Hydro-IDP model is competent to describe and predict the spreading process of information in online social networks.

We would like to thank all the authors who submitted their works to this Special Section in IEEE ACCESS. They provided the reviewers and editors a fascinating snapshot of the range of the ongoing research in the area of social enabled networking and computing. We are grateful to all reviewers, who were very responsive to our repeated reminders about staying on schedule. Their critical comments and suggestions to the authors contributed greatly to the final product. We are also thankful to the Editor-in-Chief, Dr. Bora M. Onat, Ms. Kimberly Shumard and Ms. Rebecca Hytowitz for the cooperation and encouragement they have provided to this project.

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