

# Guest Editorial on Advances in Tools and Techniques for Enabling Cyber–Physical–Social Systems—Part I

CYBER–physical–social systems (CPSS) integrate computational physical elements (seamless integration of computational algorithms and physical components) capable of interacting with, reflecting and influencing each other as well as the complicated system and information exhibited by human’s social behavior. Rapid advances in mobile cloud computing, man–machine, machine–machine communications, smart phone networks will cause a new paradigm shift in CPSS design, applications, and operations by bringing improvements not only to the quality of service (QoS) but also to quality of experience (QoE) and quality of protection (QoP) in terms of the cost efficiency, reliability, security, and energy efficiency from the human perspective of view. The integration of cyber–physical systems and social networks also provides a novel platform to address challenges in cyber–physical–social interactions and human-centric technologies development by using powerful tools such as social computing, social cooperation, and social sensing. Application examples of employing mobile computing in CPSS include traffic accidents detection in smart transportation, energy management in smart grid, health monitoring and evaluation.

The introduction of social elements into CPS poses new system design challenges and open research issues. Therefore, safety and reliability requirements of physical components are qualitatively different from general-purpose distributed computing infrastructures and lack of consistent and unified system modeling and design principles. Resources in data centers and cloud infrastructures have to be efficiently managed and scheduled to optimize reliability and scalability of CPSS under various constraints of QoE and QoP. Besides, CPSS are expected to deal with data directly coming from trans-domain applications, which could be in different forms such as GPS coordinates, flood level, temperature, rainfall rate, vehicle speed, electricity consumption. How to coordinate various applications of heterogeneous systems and facilitate a deeper integration, interaction, and personalization of the physical, cyber, and social domains is another important challenge. This Special Issue on CPSS devoted to recent addressing these challenges. A Call for Papers was issued in early 2015, with the submission deadline set to June 15, 2015. We have received overwhelming submissions, and ultimately seven high-quality papers have been selected in the first part of this special issue.

The papers can be broadly classified according to their primary focus. Papers in the first group aim at facilitating the social network technologies into the CPS using mobile social

network, machine learning, smartphones, social discovery, users’ behavior identification, pervasive social networking, and big data computing in social networks.

The paper “PIF: A Personalized Fine-grained Spam Filtering Scheme With Privacy Preservation in Mobile Social Networks” by Zhang *et al.* proposed a personalized fine-grained filtering scheme with privacy preservation in MSNs. Specifically, a social-assisted filter distribution scheme and cryptographic filtering schemes are developed to protect users’ private keywords included in the filter from disclosure to others and detect forged filters.

The paper “Safeguard: User Re-Authentication on Smartphones via Behavioral Biometrics” by Lu and Liu presented an accurate and efficient smartphone user reauthentication system based upon on-screen finger movement. A scheme through five machine learning approaches is implemented and a support vector machine-based approach is selected due to the scheme’s high accuracy.

The paper “A Performance Evaluation of Machine Learning Based Streaming Spam Tweets Detection” by Chen *et al.* proposed a performance evaluation of existing machine learning-based streaming spam detection methods. A performance evaluation is carried out from three different aspects of data, feature, and model.

The paper “Social Discovery: Exploring the Correlation among Three-Dimensional Social Relationships” by Zhao *et al.* explores the correlation among three kinds of social relationships: face-to-face social relationship, online social relationship, and self-report social relationship. Moreover, social popularity is defined according to social relationships self-reported by users.

The paper “Rumor Identification in Microblogging Systems Based on Users’ Behavior” by Liang *et al.* investigated the machine learning-based rumor identification approaches and proposed a method to predict whether a microblog post is rumor by applying five new features based on users’ behaviors and combining the new features with existing well-proved effective user behavior-based features such as followers’ comments and reposting.

The paper “Anonymous Authentication for Trustworthy Pervasive Social Networking” by Yan *et al.* proposed an anonymous authentication scheme for authenticating both pseudonyms and trust levels in order to support trustworthy pervasive social networking with privacy preservation. In addition, the batch signature verification is used to further reduce the cost of authenticity verification on a large number of messages.

The paper “Scalable Energy-Efficient Distributed Data Analytics for Crowdsensing Applications in Mobile

Environments” by Jayaraman *et al.* proposed a scalable, energy-efficient, generic, and extensible component-based distributed data analytics platform for mobile condensing application. Moreover, theoretical cost models for typical crowdsensing application scenarios are proposed and developed.

In conclusion, the papers presented in this Special Issue demonstrate the breadth and diversity of research in the field of CPSS.

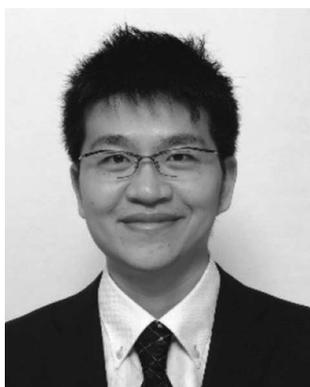
The guest editors would like to thank both the authors and the reviewers for their hard work in helping them organize this Special Issue. They would also like to express their sincere gratitude to the Editors-in-Chief, Prof. G. Cybenko and Prof. E. E. Santos, for providing this opportunity and lots of guidance throughout the process, and the editorial staff L. A. Cullen for their continuous support and professionalism.

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