Guest Editorial Introduction to the Special Section on Social Computing and Social Internet of Things

I. Introduction

SOCIAL Internet of Things (SIoT) is a new and latest paradigm that extends Internet of Things. This provides an ideal platform for interconnected devices and objects to effectively interact across social platforms for the betterment of the community on a whole. Any Social Internet of things based system means that the data is distributed in nature and focuses on the interest of a larger group of people than a particular individual. Thus social Internet of things have a wide scope and can be used to develop a wide range of applications that involves a group of people or community working towards accomplishing a common objective such as joint ventures, office setup, co-ownerships and so on.

Social Computing may be defined as the study of the collaborative behavior of a group of computer users working on some common objectives. The backbone for social computing like other new computational paradigms is internet. Social computing has provided the breakthrough for the development for several social platforms available today. Social platform has expanded to the extent where this has promoted growth and development of several small scale and large scale business opportunities. At the same time, social computing in today's scenario provides the best platform for effective marketing of products and goods and covering large mass of people through a connected network. It can be observed that social computing and social Internet of Things go hand on hand in taking distributed computing across social platform from the stage of need to excellence. Also, combining social computation and social internet of things provides the best possible means to provide sophisticated and automated applications to larger masses of connected people through social network.

The services of social computing and social Internet of things have been leveraged across almost all domains such as marketing, healthcare, business enablement, business analytics, education, smart surveillance and security, e-commerce, communication and media and remote business management. Despite the promising and shining aspects of social computing and social internet of things, there are a few challenges posed while leveraging the services of social computing and social internet of things. Both social computing and social internet of things are used by a group of users and hence maintaining and preserving the confidentiality, integrity, privacy and security of data that is being shared. Also, the fact that in general social internet of things based applications are distributed, the data storage is also distributed in nature. Hence data availability is also a challenge. Similarly, providing distributed security is a greater challenge and requires structured policies and procedures in place to promote high level of data and application security. Several research works have been carried out to mitigate these challenges.

This special section aims at presenting the current state-of-the-art research and future trends on various aspects of social computing techniques for Social Internet of Things applications and attempts to build highly adaptive smart environments that can automatically adapt behaviors to the amount of available resources. The main areas covered by this special section or main topics cover methodologies, modeling, analysis and newly introduced applications. Besides the latest research achievements, this special section also deals with innovative commercial management systems, innovative commercial applications of Social Computing technology, and experience in applying recent research advances to real-world problem.

Papers selected for this special section represent recent progress in the field, including works on communication technologies, cloud based social computing, information security, mobile social networks, and machine learning. All of these papers not only provide novel ideas and state-of-the-art techniques in the field, but also stimulate future research in the sustainable environment.

II. Security and Resource Allocation in Cyber-Physical Social System

Security and privacy are very vital to blockchain system for SIoTs. The current SIoT systems are centralized and the user's security and privacy is not properly protected. The paper by Haibo Yi, entitled "Secure Social Internet of Things Based on Post-Quantum Blockchain", proposed a blockchain system based on the ring signature. Compared with the traditional SIoTs, the proposed system is based on post-quantum techniques, which is secure against both traditional computers and quantum computers. The results of the blockchain system show that it is very suitable for SIoTs.

The paper by Hassam Mughal, Muhammad Bilal, Uttam Ghosh, Gautam Srivastava, and Sayed Chhattan Shah, entitled "Efficient Allocation of Resource Intensive Mobile Cyber–Physical Social System Applications on a Heterogeneous Mobile Ad Hoc Cloud", proposed a resource allocation scheme to allocate resource-intensive Mobile Cyber-Physical Social System applications on Heterogeneous Mobile ad hoc clouds. A new Markov chain-based approach is presented to

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predict link lifetime based on the history of user's visited locations and time spent at each location. NS-3 has been used to evaluate the performance of the proposed scheme. The simulation results show that the proposed scheme improves the performance by 60%.

SIoT enables devices to communicate with each other automatically, which is not reliable when SIoT applications are vulnerable themselves. The paper by Xiaogang Zhu, Sheng Wen, Alireza Jolfaei, Mohammad Sayad Haghighi, Seyit Camtepe, and Yang Xiang, entitled "Vulnerability Detection in SIoT Applications: A Fuzzing Method on their Binaries", proposed a BECFuzz instruments at specific edges, and conducts fuzzing based on both edge coverage and path coverage, which greatly improves its effectiveness. The authors implement their BECFuzz based on two typical fuzzers which are widely recognised as baselines, AFL and AFLFast, and run experiments on 18 real-world programs. The results demonstrate that the proposed method suppresses the state-of-art fuzzers in performance.

The paper by Yong Cui, Xiao Song, Jianwei Liu, Kai Chen, Guoqiang Shi, Junhua Zhou and Tamizharasi GS, entitled "AACF—Accessible Application-Centric Framework for the Internet of Things Backhauled Smart City Applications", introduces an Accessible Application-Centric Framework (AACF) for application-specific IoT architectures by considering the robust requirements of end-user applications. The framework aims to provide flexible application-service disseminations for end-user requests. The service requiring scalable dissemination is performed based on state learning decisions to improve the success rate and enduring responses.

III. Big Data and Graph Theory in Social IoT

The increasing scale of big (social) networks has raised the challenges in data analysis due to the complicated structure. The paper by Feng Xia, Shuo Yu, Chengfei Liu, Jianxin Li and Ivan Lee, entitled "CHIEF: Clustering with Higher-order Motifs in Big Networks", solved this problem from two perspectives: (1) breaking down complicate structure of big networks; and (2) utilising higher-order network motifs in big (social) networks instead of triangle motifs. The proposed CHIEF that offers efficient and effectiveness motif clustering for big (social) networks, and conducted theoretical analysis. Experimental results show that CHIEF-AP outperforms baseline methods in big networks.

The paper by Yuanman Li, Rongqin Lian, Wei Wei, Wei Wang, Jiantao Zhou and Xia Li, entitled "Temporal Pyramid Network with Spatial-Temporal Attention for Pedestrian Trajectory Prediction", proposed a temporal pyramid network for pedestrian trajectory prediction through a squeeze modulation and a dilation modulation. The hierarchical design of the proposed framework allows to model the trajectory with multi-resolution, then can better capture the motion behavior at various tempos. Experimental results on two benchmarks demonstrate the superiority of the proposed scheme.

The paper by Yixuan Yang, Fei Hao, Beibei Pang, Geyong Min and Yulei Wu, entitled "Dynamic Maximal Cliques Detection and Evolution Management in Social Internet of Things: A Formal Concept Analysis Approach", developed two novel formal concepts generation algorithms that can be applicable to Online Social Networks for detecting the maximal cliques and characterizing the dynamic evolution process of maximal cliques in Online Social Networks. Extensive experimental results are conducted to investigate and demonstrate the correctness and effectiveness of the proposed algorithms. The results reveal that the proposed algorithms can efficiently capture and manage the evolutionary patterns of maximal cliques, including unchanged, changed, added, and vanished maximal cliques in Online Social Networks, and a quantitative relation among them is presented.

The paper by Guofeng Qin, Shuo Yang and Sichang Li, entitled "A Vehicle Path Tracking System with Cooperative Recognition of License Plates and Traffic Network Big Data", proposed a system of vehicle route tracking. By using traffic network big data, the proposed system is capable of cooperatively identifying the license plates of moving vehicles from videos recorded by multi real-time surveillance cameras, and then mining their driving routes. The accuracy of moving vehicle extraction has been improved to 97.4% by using the improved visual background extractor algorithm.

IV. Social Computing Intelligence

In the social Internet of Things, millions of different intelligent objects connect and communicate with each other, and social data emerge rapidly, which puts forward higher requirements for the rapid dissemination of valuable information. The paper by Fangfang Luo, Genggeng Liu, Wenzhong Guo, Guolong Chen and Naixue Xiong, entitled "ML-KELM: A Kernel Extreme Learning Machine Scheme for Multi-Label Classification of Real Time Data Stream in SIoT", proposed a multi-label algorithm based on kernel extreme learning machine. The comparison experiment shows that the proposed ML-KELM has better effect and fast response. In addition, incremental learning of the model is realized from the two aspects of example increment and class increment. Therefore, ML-KELM is suitable for data stream environment.

Social computing which analyzes users' behaviors can help personalized recommender system to extract preferences of users. The paper by Shenghao Liu, Bang Wang, Laurence T. Yang and Philip S. Yu, entitled "HNF: Hybrid Neural Filtering based on Centrality-aware Random Walk for Personalized Recommendation", proposed a HNF algorithm which learns collaborative representation and topological representation and fuses them as hybrid representation for top-n recommendation. The study conducted experiments on three real-world public datasets. Results validate that the proposed HNF algorithm outperforms the state-of-the-art algorithms in terms of higher evaluation metrics.

The paper by Zhiwei Guo, Keping Yu, YuLi, Gautam Srivastava and Jerry Chun-Wei Lin, entitled "Deep Learning-Embedded Social Internet of Things for Ambiguity-Aware Social Recommendations", proposed a deep learning-embedded social Internet of Things (IoT) for ambiguity-aware social recommendation. Specifically, a social IoT architecture is developed for social computing scenarios to guarantee reliable data management. This

design not only provides proper online data sensing and management but also overcomes the preference ambiguity problem in social recommendation. The experimental results show that the proposed solution performs better than the benchmark methods by at least 10% and has good robustness.

The paper by Gunasekaran Manogaran, Bharat S. Rawal and Mamoun Alazab, entitled "Boosted Tree Classifier Algorithm based Collaborative Computing Framework for Smart System", introduces a Collaborative Computing Framework in a view to improving the performance of the smart industries. Considering the facts of less human intervention and controlled manufacturing processes, the proposed Collaborative Computing Framework relies on harmonized scheduling between different industrial units. From the logistics performance assessment, it is seen that the proposed CCF retains less cost factor and delayed instances.

V. Conclusion

All of the above papers address either technical issues in social computing technologies or information security or propose novel application models in the various cyber-physical-systems and social computing fields. They also trigger further related research and technology improvements in application of social computing. Honorably, this special section serves as a land-mark source for education, information, and reference to professors, researchers, and graduate students interested in updating their knowledge of social, cyber-physical-system, Internet of things, and novel application models for future information services and systems. The special section of this journal covers different aspects of the problem, from both the theoretical and the practical side. After a large open call, an international editorial committee selected twelve research papers. Each paper was reviewed by at least 3 reviewers.

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