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Editorial

Crowd computing for social media ecosystems

1. Introduction

The recent decade has witnessed the birth of social media ecosystems that brings social organizations, media content and various stakeholders together, and now it appears significant advantages of comprehensiveness, diversity and wisdom that provide users with higher quality of experiences. With the explosive increase of social users, as well as the popularity of pervasive (mobile) social media tools and services, more and more users are much addicted to share personal feeling, sentiment, idea and experience to a wider range of friends, even friends of friends, by using video, images and photos, etc. Meanwhile, social media ecosystems suffer from security, privacy and trustworthiness threats. How to leverage the power of intelligent crowds to improve the ecosystem's efficacy and efficiency, as well as ensure its security and privacy become burning and challenging issues.

The research on social media ecosystems is an interdisciplinary theme, which is also called umbrella terminology, as it, in essence, includes multimedia communication, computer science, social science, and even human science and psychology. As computer science and engineering professionals, we are generally concentrated on theory, model, algorithm and solution on social media ecosystems, especially applied soft computing in the big data era nowadays, as well as social security, privacy, trust and privacy by using soft computing. Peng et al. provided a comprehensive investigation of social influence analysis, and discussed the characteristics of social influence and the architecture of social influence analysis based on social networking big data [1]. In order to find out a better way to implicitly collect users' contexts and to understand users, Abdar et al. designed a universal model that supports dynamic analysis and mining of user-generated content (or contexts). Moreover, they explored into two major factors, both sensing and analysis of crowd preference and their decision-making behavior [2]. Zhang et al. [3] proposed a novel situational analytic method for crowd users behavior patterns by using generalized sequential pattern for multimedia big data, and made experiments on a social media platform prototype named as CyVOD.

One of the emerging computing paradigms, crowd computing, which could accomplish formerly impossible computational task employing thousands and millions of workers, has dramatic developments and killer applications. As discussed, this novel computing mode is also very suitable for a social media ecosystem where a large volume of users exist. Xiao et al. pointed out mobile crowdsensing is a new paradigm in which a crowd of mobile users exploit their carried smart phones to conduct complex sensing tasks. For this purpose, they investigated the makespan sensitive task assignment problems for the crowdsensing in mobile social networks, and proposed an Average makespan sensitive Online Task Assignment (AOTA) algorithm and a Largest makespan sensitive Online Task Assignment (LOTA) algorithm [4]. In addition, as a killer application, the effective social media recommender system is fundamental requirement for a large scale social network ecosystem. Eirinaki et al. made a comprehensive survey on the state-of-the-art models and methods, together with some issues and challenges [5]. Zhao et al. presented a context-aware approach for trustworthy worker selection in social crowd, with a goal of addressing many difficult tasks (e.g., image tagging and sentiment analysis) on the internet and make full use of the wisdom of crowd [6].

Last but not least, some malicious, unauthorized accessing to social media are threatening social media ecosystems. Reference [7] presented spectrums on social security and trust particularly for the increasingly growing sophistication and variety of attacks, and this is the first survey article proposing a new applied direction on crowd computing, which is essential for social media ecosystems. From the perspective of the ecosystem security, Zhang et al. explored a novel method for crowd evaluations on the security and trustworthiness of online social network platforms based on signaling theory, which have been generally employed in the fields of economics and information management [8].

To the best of our knowledge, this is the first thematic issue discussing how to leverage crowd computing to social media ecosystems. This special issue seeks to the state-of-the-art crowd computing theories and methods, with a particular emphasis on advanced crowd computing and crowd intelligence methodologies applicable for real-world social media, and encourages more practical validated techniques, not focused on pure conceptual model, framework and building blocks descriptions. Some valuable works were solicited for this special issue with a consideration on the following aspects:

Social media network architecture, model and new paradigm by using crowd computing;

- Crowd computing and crowd intelligence methodologies for social media recommendation and sentimental analysis;
- Social media content security, vulnerability and forensics based on crowd intelligence and soft computing;
- Performance metrics and benchmarks studies on crowd computing for social media;

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- Ubiquitous, personal and mobile social media applications based on crowd intelligence;
- Social media prototypes and empirical studies together with crowdsourcing.

This special issue finally contains seven papers which were selected after rigorous review process to deal with different aspects of social media ecosystems [9–15]. There includes crowd social media computing survey paper, and original technical article from different aspects with embracing social relationship inferring, location privacy, influence maximization, and other crowdsourcing-enabled applications.

2. Contributions

The first survey paper entitled, "Crowd Social Media Computing: Applying Crowd Computing Techniques to Social Media", authored by Nafaâ Jabeur et al., explores the existing models the characteristics of the social media ecosystem, discusses the characteristics of crowd computing, and then demonstrates how crowd computing can play a pivotal role in emerging social media applications. They also propose a new approach to evaluate the impact of crowd computing on the issue of social media Return of Investment (ROI), which is an interesting economics, as they considered that social media producers are currently having a fierce competition worldwide to increase the revenues. The authors point out the possible challenges for implementing a crowd computing-based approach for social media from multiple perspectives of goal, content, audience, computing platform, usage, data and ROI. Finally, they make a conclusion on some future research areas, including (big) structured and unstructured data integration and management, seamless integration with Cyber Physical Systems (CPSs), intelligent human-machine collaboration techniques, and so on.

The second article entitled, "Crowdsourcing based Scientific Issue Tracking with Topic Analysis" authored by Mucheol Kim et al. presents a multi-layered information analysis method that reflects the crowdsourcing concept to generate focused topic group. The proposed method uses a combination of data generated for different methods and purposes in order to overcome the disadvantage that existing topic analysis methods generate unspecific topic groups for distributed topics. The authors make experiments and analysis on issue keywords, in order to confirm the analysis results and the recommended keywords are extended by relationship from research papers. As a result, the approach could index documents based on the extended keywords and generate crowdsourcing-based topic issues.

The third article entitled, "Inferring Tag Co-occurrence Relationship across Heterogeneous Social Networks" authored by Jinpeng Chen et al. points out that few studies pay attention to how to predict tag co-occurrence relationship across heterogeneous networks. To this end, they study the problem of the tag co-occurrence relationship prediction in Flickr heterogeneous social network, present a novel data structure namely image-tag bins for capturing the correlation between images and tags in the Flickr network and how to leverage a weight path-based feature space based on image-tag bins to illustrate structural information in co-occurrence prediction. Besides, the authors consider two viewpoints when predicting co-occurrence relationship, and finally make a series of experiments on real dataset indicate that our proposed method can predict co-occurrence relationship with high accuracy compared with the state-of-the-art link prediction methods.

The forth article entitled, "Protection of Location Privacy for Moving kNN Queries in Social Networks" authored by Tinghuai Ma et al. attempts to address a burning issue on the existing location-based service applications, where users need to send their current locations to get the service, which may lead to the leakage of their location privacy. Meanwhile, they present a possible effective way to protect the user's location privacy, that is using an imprecise location, such as a region to replace his real location. But, when processing continuous queries, the user need to transmit the region to the server continuously and an attacker is able to infer the real location from the overlapping regions. For this, the author study the overlapping circle attack and design a method to avoid this attack by changing the confidence level to a fixed value, with a result of presenting a novel algorithm to process a *k*NN query while protecting user's location against the attack.

The fifth article entitled, "A Holistic Approach to Influence Maximization in Social Networks: STORIE" authored by N Sumith et al. clearly presents that one of the challenges of crowd sourcing system is to recruit right users to be a part of successful campaigns. They propose a novel model called Restrained-Susceptible-Infected-Recovered to depict the user's role in the diffusion process in social networks. This model addresses the gaps of SIR model, and the scalability issue is also addressed by pruning the social network. They adopt a method for Inuence Estimate (IE) to estimate user influence in social networks, and use the seed selection heuristic to solve influence maximization.

The sixth article entitled, "SCFM: Social and Crowdsourcing Factorization Machines for Recommendation" authored by Yue Ding et al. proposes social and crowdsourcing factorization machines: SCFM. The approach's highlight is to fuse social and crowd computing into the factorization machine model. Especially for crowd computing, the authors apply LDA (Latent Dirichlet Allocation) on people reviews to obtain sets of underlying topic probabilities. Besides, they propose social regularization and domain inner regularization to improve recommendation accuracy.

The last article entitled, "Studying the Controversy in Online Crowds' Interactions" authored by Mahmoud Al-Ayyoub et al. proposes that we present a hybrid approach that benefits from structural and content-based approaches to detect controversies in Twitter's trending topics. The authors apply a set of controversy measures on the retweet graphs, and employ content-based controversy detection by computing performing SA and SD on the collected tweets. To the best of the authors' knowledge, this is the first study applied to Arabic social media using topics of different domains.

3. Conclusion

This special issue focuses on the fusion of both the emerging crowd computing and social media ecosystems, especially discussing how to employ crowd computing, including soft computing methodologies, for social media applications. We not only briefly present the original motivations and highlights of all accepted papers, but also explore other some interesting works relative to the thematic issue. From those featured perspectives, the crowd computing for social media would spur much more attention from social media industry and academia.

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Zhiyong Zhang *
Henan University of Science and Technology, China

Kim-Kwang Raymond Choo
University of Texas at San Antonio, USA

Arun Kumar Sangaiah
Vellore Institute of Technology, India

Liang Chen
University of West London, United Kingdom

* Corresponding author.
E-mail address: xidianzzy@126.com (Z. Zhang)

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