



The convergence of new computing paradigms and big data analytics methodologies for online social networks



1. Introduction

Over past decade, the developments of Web 3.0, Web 4.0 and Science 2.0 have become critical network infrastructure and knowledge platform for all socially organized participating entities (man, machine, group, and even brain-like computer) for exchanging, sharing, contributing a great amount of data, information, knowledge. Meanwhile, the popularity of online social networks tools, platforms, applications and services spurs much more interactions and collaboration at larger scale than ever before. The better leverage of those social big data for improving social network services depends on new computing paradigms and analytics methodologies to a great extent, such as social-sensed multimedia computing, aware computing and situation analytics, and so on. In addition, various forms of attacks constantly occur, including identity theft, social fishing, impersonation attack, hijack, image retrieval and analysis, fake requests, and Sybil and other malicious software attacks [1]. Malicious attacks also came from social bots [2]. Resolving of all the challenging issue does need more effective and efficient computing and analysis methods.

2. Applicable computing paradigms and special issue

Recent two years, some scientists and researchers pay more attention to computing paradigms for social networks and service computing. Cui et al. presented two kinds of gaps, i.e., semantics gap and need gap in multimedia systems and applications nowadays [3]. Especially for the need gap, there needs more works towards understanding, analyzing and predicting user's interests and intents. For thus, they proposed social-sensed multimedia computing to handle the essential requirement based on more social knowledge about user-media interactions through social sensing. In 2014, Chang and Schilit [4] proposed a new concept of aware computing, which is from the various cutting-edge technologies enabling rich sensing of the environment. Both of them highlighted that the next wave of aware computing—driven by more diverse sensors and richer data—is still emerging from academic and corporate research centers [4]. Followed by the aware computing, Chang presented situation analytics (abbr. Situ) framework as a new paradigm of software engineering in human dominance era [5]. Situ is a featured fundamental for computational methods of user mental and intention analysis based on three-tuple sequences $Situ(t)$ like $(Environment, Action, Desire)_t$ with the temporal feature. Based on Chang's Situ, Zhang et al. further proposed

Socialsitu, which a novel method for social behavior pattern analytics, to explore the user situation and context in social domain [6].

Besides, in order to explore the structure and organization of online social networks, as well as improve OSNs services and user quality of experiments, some researchers made many valuable and applicable research works. Luo et al. proposes a novel model for detecting missing links in social networks by using the utility function computation and logistic regression estimating the parameters of the proposed algorithm [7]. To resolve a drawback that crucial nodes are misclassified as the most popular nodes, Kaur et al. proposes a method for ranking based comparative analysis of graph centrality measures to detect negative nodes for large-scale networks through graphs as well as computational statistical measures [8]. Eirinaki et al. made a comprehensive survey on recommender systems for large-scale social networks, including context-aware recommender systems, community-aware or social recommender systems, and so on. Some challenging issues and related solutions were also presented in detail in the survey [9]. Another interesting paper focused on information dissemination by through defining several types of tweets as i) information provision (IF), ii) advertisement (AD), and iii) both (IFAD), and exploring and understanding customer experience diffusion based on big data analytics [10].

To the best of our knowledge, this is the first special issue discussing new computing paradigms and social big data analytics for OSNs. The special issue attempts to collect high-quality survey paper and original research articles closely related to the recommended topics, and bring together computational science, social media networks and big data-oriented academic researchers, engineers and administrators resorting to the state-of-the-art technologies and ideas to adopt both advanced computing paradigms and big data analytics for OSN, with a result of an in-depth user behavior analytics as well as an resolution of security and trust issues, etc. The special issue encourages more practical, validated computational theories and big data analytics techniques in a real-world social media networks, not focused on pure and simple conceptual model, framework and building blocks descriptions. Some valuable works were solicited for this special issue with a consideration on the following aspects:

- Advanced computing paradigms and computational theories outreach applicable for social media big data analytics
- Aware computing methodologies for social media and recommendation system

- Situational analytics for social media big data mining and applications
- User behavior analytics for social-sensed multimedia computing
- New computing paradigms performance metrics and benchmarks in the process of big data
- Computational technologies-employed security, trust management and assessment, as well as social-factor considerations in social media ecosystem
- Social media prototypes and empirical studies together with new computing paradigms

This special issue finally contains seven papers which were selected after rigorous review process to deal with different aspects of social media ecosystems. There includes the cyber-physical symbiotic social networks modeling, computational model and analysis for general OSNs platform, machine learning, deep learning, recommendation, optimization and evolution algorithm for social network and natural language processing, etc.

3. Advance on social computational and big data analytics

The first article entitled, “Pokémon GO in Melbourne CBD: A case study of the cyber-physical symbiotic social networks”, authored by Derek Wang et al., models the formation of the symbiotic social networks in both physical world and cyber world, as well as interactions between players and Pokémon GO elements [11]. Finally, they reveal the relatively weak correlation between the formation processes of the two networks. Interestingly, the paper points out that from an economic perspective, the study of cyber-physical symbiotic social network formation could provide insight into mechanisms of social capital creation and social influence generation compared with purely physical or virtual/cyber social networks.

The second article entitled, “A novel crowd evaluation method for security and trustworthiness of online social networks platforms based on signaling theory”, authored by Zhang et al. [1], classifies and formalizes the security and trust-critical signals of generic OSNs platform, and proposes a comprehensive computational model for security and trustworthiness measurement inspired by crowd computing, after signals weights were yielded based on Fuzzy Analytic Hierarchy Process Comprehensive Evaluation Zhang et al. [6,12]. Finally, a case study is done on a multimedia social network platform called CyVOD.

The third article entitled, “HotML: A DSM-based machine learning system for social networks”, authored by Yangyang Zhang et al., proposes HotML, which is designed in the parameter server (PS) architecture where the servers manage the globally shared parameters organized in tabular structure, and the workers compute the dataset in parallel and update the global parameters [13]. Besides, the authors presents in their conclusive remarks that HotML has already been integrated into RING, an online event detection platform for social networks, as the fundamental machine learning system.

The fourth article entitled, “A hybrid optimizer based on firefly algorithm and particle swarm optimization algorithm”, authored by Xuewen Xia et al., proposes HotML, which is designed in the parameter server (PS) architecture where the servers manage the globally shared parameters organized in tabular structure, and the workers compute the dataset in parallel and update the global parameters [14]. Besides, the authors presents in their conclusive remarks that HotML has already been integrated into RING, an online event detection platform for social networks, as the fundamental machine learning system.

The fifth article entitled, “Enhancing differential evolution with random neighbors based strategy”, authored by Hu Peng et al., pro-

poses a random neighbor based mutation strategy (DE/neighbor/1) to cope with the perplexing question about balancing between the global and local search and improve the optimization performance of differential evolution algorithms [15]. Experimental studies are simulated using a set of well-known benchmark functions. Comprehensive experiments demonstrate the effectiveness and efficiency of the proposed algorithm.

The sixth article entitled, “Micro-blog topic recommendation based on knowledge flow and user selection”, authored by Shunxiang Zhang et al., presents a novel algorithm of micro-blog topic recommendation based on knowledge flow and user selection in this paper to improve the accuracy and efficiency of micro-blog topic recommendation, aiming at the problem of micro-blog topic information overload [16]. As discussed by the authors, in the future, the algorithm can be optimized in the organization of knowledge flow to generate more reasonable knowledge flow of micro-blog topic.

The seventh survey paper entitled, “Deep learning for Arabic NLP: A survey”, authored by Mahmoud Al-Ayyouba, et al., makes a survey of related works on using deep learning techniques for natural language processing, especially for Arabic language, considering that NLP techniques can help in addressing many interesting problems in OSN such as geo-location identification, public opinion mining, sentiment/emotion analysis, trend analysis, event extraction, controversy detection, crowd monitoring, and so on [17].

4. Conclusion

This special issue focuses on the emerging computing paradigms and big data analytics methods for online social networks, including computational model, algorithm, application and use case study. In essential, the related works are originated from big data, and are stepping for smarter systems and applications. Note that the situation analytics, as a new computing and software engineering paradigm, is very suitable for social network domain. The future works on social situation analysis and computational science are more attracted and investigated by researcher, engineering and policy-makers in social network fields.

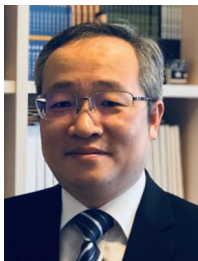
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