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## : EDITORIAL

# IEEE ACCESS SPECIAL SECTION EDITORIAL: TRUST MANAGEMENT IN PERVASIVE SOCIAL NETWORKING (TruPSN)

With the rapid growth of mobile computing and social networking, social networks have extended their popularity from the Internet to mobile domain. Pervasive Social Networking (PSN) ensures social communications at any time and in any place with a universal manner. It supports online and instant (i.e., pervasive) social activities based on heterogeneous networks, e.g., the Internet, mobile cellular networks or self-organized networks or other networking technologies. It is treated as one of the killer applications in the next generation mobile networks and wireless systems (i.e., 5G). There are various applications over PSN. Typical examples include social chatting, gaming, rescuing, recommending and information sharing. Because group mobility is very common in modern life, PSN has become valuable for mobile users, especially when they are familiar strangers and often appear in the same vicinity. PSN greatly extends our experiences of social communications.

There are quite a number of vivid research activities related to PSN in both academia and industry. However, trust and reputation management has not been extensively considered in existing projects, although trust plays an important role in PSN for reciprocal activities among strangers. It helps people overcome uncertainty, makes wise decisions, avoids unnecessary risks, and engages in trust-related social behaviors. In the literature, trust and reputation mechanisms have been widely studied in various fields. However, traditional online social networking systems (e.g., Facebook) and current PSN research have not fully taken user trust into consideration. They have not comprehensively investigated how to manage trust in PSN in a holistic manner. A number of issues, such as trustworthy identification and authentication, PSN data communication security, user privacy preservation, trust relationship evaluation, evolution and enhancement, unwanted information control, privacy-preserving social data search and mining, user-device trust interaction, etc. have not been extensively studied. Pervasive social networking introduces additional challenges to track and resist malicious social behaviors in practice, especially when user privacy and PSN security should be seriously considered and stringently supported.

This Special Section aims at presenting advanced academic and industrial research results related to trust management

in PSN. We finally selected 11 articles after a rigorous review process for publication in this Special Section. These articles cover wide topics such as malicious social account detection, PSN data access control and protection, privacy preservation, trust evaluation and recommendation, social opinion mining, and so on. In what follows, we briefly introduce each article.

In the article “ProGuard: Detecting malicious accounts in social-network-based online promotions,” Zhou *et al.* proposed a system named ProGuard to detect malicious accounts in a variety of business activities based on online social networks. It achieves its detection goal by considering account general behaviors, recharging patterns, and currency usage. The experiments based on real world data collected from Tencent QQ demonstrated the effectiveness of ProGuard.

In the article “Secure pervasive social communications based on trust in a distributed way,” Huang *et al.* proposed two schemes to secure communication data in PSN purely based on local trust evaluated by PSN nodes in a distributed manner. They aimed to overcome the drawbacks of the data access control solutions based on a centralized server in order to support crucial PSN activities and enhance user privacy. Each node can control its data based on its trust in other nodes by applying Attribute-Based Encryption (ABE).

In the article “A secure system for pervasive social network-based healthcare,” Zhang *et al.* proposed two schemes to securely share health data with other nodes in PSN. The first one is an improved version of the IEEE 802.15.6 display authenticated association for mobile devices and resource-limited sensor nodes. The second one uses blockchain technique to share health data among PSN nodes.

In order to effectively establish key agreement among vehicles, Li *et al.* proposed an efficient physical layer key extraction method by utilizing received signal strength to generate secret keys in the article, “efficient and consistent key extraction based on received signal strength for vehicular ad hoc networks”.

Feng *et al.* proposed a scheme for anonymous authentication on trust in PSN based on group signature in the article “Anonymous authentication on trust in pervasive social networking based on group signature,” for the purpose of secure authentication with anonymity and conditional traceability no

matter whether a trusted authority is available or not. For improving the efficiency of authenticity for a large number of messages, batch signature verification was further utilized to support scalability.

Shen *et al.* proposed a hierarchical evaluation system to support secure and trustworthy PSN in the article “Hierarchical trust level evaluation for pervasive social networking”. The system solves the problem of trust evaluation in PSN and guarantees the secure communications among trusted nodes.

Li *et al.* proposed a recommendation model named RM-UI in the article “A similarity scenario-based recommendation model with small disturbances for unknown items in social networks” for overcoming two issues: “cold start” and “excessively mature recommendation”. The authors derived the recommendation values of items from the probabilities calculated by a similar mature recommendation system during system initiation for solving the “cold start” issue. For overcoming “excessively mature recommendation”, RM-UI also recommends items with low recommendation probabilities to some extent to enable some items that can bring welfare to the recommendation system.

D2D network acts as a practical communication platform for PSN. In order to ensure trustworthy cooperation among D2D communication users, Yan *et al.* proposed a Trust-oriented Partner Selection Mechanism (TPSM) in the article “Trust-oriented partner selection in D2D cooperative communications” to avoid choosing the users with non-cooperative behaviors. Multi-dimensional trust relationships between sending users and cooperative users are evaluated by considering cognition trust, emotion trust, and behavior trust. The users are classified into reliable users, observed users, and unreliable users. With the above trust evaluation and user classification, an optimal partner selection mechanism was further proposed to support different scenarios.

For providing uniform trust management in PSN and reducing computational cost at the same time, Sharma *et al.* presented a pervasive trust management framework that can generate trust values between the users with a low cost of monitoring in the article “computational offloading for efficient trust management in pervasive online social networks using osmotic computing”. The proposed approach uses a flexible mixture model and applies the concept of osmotic computing to perform computational offloading in order to reduce the number of computations and save computational time.

In the article titled “Towards a trust prediction framework for cloud services based on pso-driven neural network”, Mao *et al.* introduced a hybrid prediction algorithm named PSO-NN by using Particle Swarm Optimization (PSO) to enhance Neural network (NN) for predicting the trust rates of cloud services in an accurate way by optimizing its initial settings.

Lv *et al.* studied opinioned posts in Sina Weibo in the article “Opinioned post detection in Sina Weibo” in order to overcome two challenges: short text in Sina Weibo and

the absence of ground-truth data for training models. They proposed a weakly supervised framework named Graph-based Opinioned Post Detector (GOPD) to detect the opinioned posts by utilizing three types of user interactions: reposting, responding, and referring. An Opinioned Similarity Graph (OSG) is constructed to describe the opinion similarity between posts through classification.

During the production of this Special Section, we experienced many interesting and novel ideas and reviewed a number of qualified research results. We would like to thank all authors and reviewers for their contributions to it. We believe trust management in PSN is a vivid and promising research topic worth our further exploration and investigation. We hope this Special Section is valuable for its readers and can benefit their future research and development. We will be very happy if further interests could be stimulated by reading the various perspectives presented herein.

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2013. In 2014, he was the Vice-Chair of the IEEE Canada Atlantic Section, where he is currently the Chair. He was in the steering committee of the IEEE/ACM Supercomputing conference series from 2008 to 2011, in the National Resource Allocation Committee of Compute Canada from 2009 to 2013, and the Scientific Committee Chair of the Engineering, Mathematics and Computing Science of Compute Canada from 2012 to 2013. He has been acting as an author/co-author or an editor/co-editor of over 25 books from well-known publishers. The book *Mobile Intelligence* (Wiley, 2010) received an Honorable Mention by the American Publishers Awards for Professional and Scholarly Excellence. He received several best paper awards, including the IEEE Best and Outstanding Conference Awards, one Best Paper Nomination, the Distinguished Achievement Award in 2005 and 2011, and the Canada Foundation for Innovation Award in 2003. He is the editor-in-chief of several international journals. He is serving as an Editor for many top international journals, such as the IEEE SYSTEMS, *Information Sciences* (Elsevier), *Information Fusion* (Elsevier), *Future Generation Computer Systems* (Elsevier), and *Big Data Research* (Elsevier). He has been invited to give around 32 keynote talks at various international conferences and symposia.



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