Guest Editorial: Special Section on Social Computing and Social Knowledge for e-Learning

Timothy K. Shih, *Senior Member, IEEE* and Julita Vassileva, *Member, IEEE*

New web technologies and especially social networks enable users to share and discuss common interests and provide infrastructures for integrating various user experiences: synchronous and asynchronous communication, game-playing, sharing links and files. Social network and social interaction using mobile and cloud platforms capture vast amounts of data that can be mined to discover implicit knowledge, common beliefs, preferences, and experiences, that could potentially empower users to learn from each other and together. The trend of using social networks and social media to deliver and exchange knowledge could bring a new era of teaching and learning. Unlike a traditional e-leaning paradigm with pre-defined curriculum and standard textbooks, social knowledge could be aggregated on demand, just in time, and in context of engaging challenges from social networks, making learning more exciting, social and, game-like experience. Therefore, the use of social computing techniques and social knowledge for e-learning is being actively investigated.

This special section of the *IEEE Transactions on Learning Technologies (TLT)* focuses on technologies and experiences of using social networks in e-learning. In addition to open submission, the best papers from top international conferences in related areas were invited. Thirty-one submissions were received. Of these, twenty-two were in scope and went through several rounds of peer-review. Finally, five papers were accepted (21 percent).

The scope of the submissions shows the vigor and diversity of research that is going on in the area at the moment. One third of the submissions focused on recommending either team members for collaboration (three submissions) or content (three submissions) using social interactions data in online social learning environments. Since the methodology in the area of recommender systems is fairly mature, with clear standards for evaluation, half of these submissions ended up meeting the standard for acceptance.

Four submissions focused on mining patterns from learner actions and social media data. The area of educational data mining is also well established (with its own conference and clear standards for evaluation) and the highest proportion of accepted papers (three out of four) came from this group.

Three submissions investigated possibilities for integrating learning experience in specific online social networks, applications or massive open online courses (MOOCs). Unfortunately, mostly due to the difficulty of carrying out evaluations in open commercial systems, the papers in this group could not demonstrate convincing results. Two further submissions addressed user motivation in social learning environments through gamification or self-assessment. None of these papers was able to meet the standard for publication. The remaining submissions applied techniques specific for social computing (e.g. tagging, social virtual worlds, trust and reputation, bee colony optimization algorithms) in the context of (collaborative) learning environments and investigated pedagogical issues and user experience. All of these papers, even though not accepted in the special section, showed that interesting and original research is going on in the area, which will hopefully lead to significant and influential results in the future.

Five papers comprise the special section. Two of them focus on recommending members for a team or recommending content in social learning networks and environments.

"Facilitating Enhanced Social Collaboration in Mobile Cloud-Based Learning: A Teamwork as a Service (TaaS) Approach" by Geng Sun and Jun Shen describes a collaborative platform in Moodle that allows the configuration of jigsaw classroom collaboration between students on both desktop and mobile devices. Kolb's experiencial learning cycle and learning styles is used by a service, implemented in a cloud-based infrastructure, to group learners in teams based on their social features. A genetic algorithm is used to discover successful team task allocations. A simulation-based evaluation shows that the genetic algorithm delivers good team formation and task allocations. The user evaluation is based on three case studies in several university-level courses. The results show improvement in the collaborative learning experience of students and a high evaluation of the tool by the teachers.

"A M-Learning Content Recommendation Service by Exploiting Mobile Social Interactions" by Han-Chieh Chao, Chin-Feng Lai, Shih-Yeh Chen, and Yueh-Min Huang analyzes a mobile learning community, and develops a time-varying recommendation strategy based on individualized responding messages. The results show that learners are more willing to continue their learning process based on the recommendation, which can also be used to attract additional learners. The experiments use 17 primary school students as the test subjects. The findings show that the

- *T.K. Shih is with the National Central University, Taiwan. Jhongda Rd., Jhongli City, Taoyuan County 32001, Taiwan, R.O.C. E-mail: timothykshih@gmail.com.*
- *J. Vassileva is with the Department of Computer Science, University of Saskatchewan, 176 Thorvaldson Bldg., 110 Science Place, Saskatoon, SK S7N5C9, Canada. E-mail: jiv@cs.usask.ca.*

For information on obtaining reprints of this article, please send e-mail to: reprints@ieee.org, and reference the Digital Object Identifier below.
Digital Object Identifier no. 10.1109/TLT.2014.2342811

1939-1382 © 2014 IEEE. Personal use is permitted, but republication/redistribution requires IEEE permission.
See http://www.ieee.org/publications_standards/publications/rights/index.html for more information.

number of common friends is correlated to the similarity of friends, as well as to the total number of friends. The recommendation strategy results in a 73.3 percent of interests overlap (i.e., successful recommendation). One of the advantages of the proposed approach is that even if the learner has not yet studied any content, the recommendation system can suggest contents to start with.

The next three papers involve analysis of action patterns and data mining techniques to generate recommendations, to understand better the student's learning experience and the use of social tools in MOOCs.

"Discovery of Action Patterns and User Correlations in Task-Oriented Processes for Goal-Driven Learning Recommendation" by Xiaokang Zhou, Jian Chen, Bo Wu, and Qun Jin explores how a social network allows individuals to learn from each other through interactions and collaboration. User behavior patterns and correlations are used to implement a goal-driven recommendation system. The system can automatically detect learning action patterns. In an evaluation involving 57 users and 12,066 learning actions, the system was able to identify 13 types of common learning actions. The pattern analysis considers instant interaction based on time changes and can be used in the analysis of task-oriented collaboration process. The evaluation of the goal-driven learning recommendations generated shows that 95 percent of the recommended actions were considered effective in facilitating users to complete their specific learning process.

"Mining Social Media Data for Understanding Students' Learning Experiences" by Xin Chen, Mihaela Voroveanu, and Kristina Madhavan uses Twitter posts to understand the discussion issues and problems in the educational experiences of engineering students. The authors use a classifier with 35,000 tweets as training data, to implement a classification system based on Bayes Multi-label Classifier. The system is used to analyze behaviors of students in Purdue University. The results indicate that heavy study load, lack of social engagement, sleep deprivation, are common problems among the students. The contribution is useful for researchers in learning analytics and educational data mining to understand better relevant aspects of the general learning context in a community of students. The result can also benefits administrators and decision makers to understand experiences of engineering students. The mining techniques can be further used in other social media.

"Delving into Participant's Profiles and Use of Social Tools in MOOCs" by Carlos Alario-Hoyos, Mar Pérez-Sanagustín, Carlos Delgado-Kloos, Hugo A. Parada G., and Mario Muñoz-Organero presents an empirical analysis of student profiles in massive open online courses practical experience. The study focuses on the usages of five social tools, including Twitter and Facebook. The authors suggest that using different social media to allow individual preferences may help to utilize the discussion, thus helping the completion rate of MOOCs courses.

This special section documents the state of the art in the area of social computing and social knowledge for e-Learning during the period 2013/2014. From the large number and variety of submissions, it is clear that this is a very active area with a lot of interesting ongoing research. While a large proportion of the submitted work was not yet technically or methodologically advanced enough to warrant journal publication in *TLT*, it is evident that soon new exciting approaches in the areas of studying motivational issues in social context, exploring educational uses of specific existing social networks and deploying specific social computing techniques will be maturing.

Timothy K. Shih,
Julita Vassileva,
Guest Editors

Timothy K. Shih is a professor at the National Central University, Taiwan. He was the dean of the College of Computer Science, Asia University, Taiwan, and the Department chair of the CSIE Department, Tamkang University, Taiwan. He also joined the Educational Activities Board of the IEEE Computer Society. His current research interests include multimedia computing and distance learning. He has edited many books and has authored more than 460 papers and book chapters. He is a fellow of the Institution of Engineering and Technology (IET). In addition, he is a senior member of the ACM and IEEE.

Julita Vassileva is a professor of computer science at the University of Saskatchewan, Canada. She is interested in how to use personalized recommendations, games and social influence to support people in their learning and engaging in beneficial behaviours. She serves on the editorial boards of the *International Journal of User Modelling and User Adapted Interaction* (Springer), *Computational Intelligence*, and *IEEE Transactions on Learning Technologies* and has been a member of the executive committee of the AI and education society for three terms. He is a member of the IEEE.