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Editorial

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With the rapid development of massive online open course (MOOC), Web 2.0 online communities, social media, and mobile technologies in the big data era, there has been a fast increase of learning resources such as online learning communities, open course videos, and learning materials (e.g., web pages, animations and documents). Such a large volume of learning data requires users to build up effective skills of information organisation and management. To achieve this goal, it is essential to develop powerful and versatile user model, containing various user information such as learning preferences, styles, backgrounds, pre-knowledge and contexts. This user model can be exploited and applied to a range of web-based learning applications such as personalised learning paths discovery (Feng et al., 2010), learning resource recommendations (Xie et al., 2016), course opinions (Bhatt and Kumar, 2014) and sentiment analysis (Rao et al., 2016).

Selected papers presented at the First International Workshop on User Modeling for Web-based Learning (IWUM 2015), the 14th International Conference on Web Based Learning (ICWL 2015), and the 1st International Technology Enhanced Language Learning Workshop (TELL 2015) are invited to submit their extended versions to this special issue. The invited papers and other submitted papers were reviewed together by international experts in user modelling and learning analytics. After a very rigorous review, seven papers are accepted for publication in this special issue.

Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments where it occurs (Long and Siemens, 2011). The first step in learning analytics is to measure and collect data about learners. The first two papers discuss the techniques to automatically evaluate learners' performance.

The first paper, 'eALGO: an automated assessment tool of flowchart programs for novices' proposes an automatic grading system based on graph matching algorithms for computing program cases. The technique proposed is critical in an e-learning system, because it provides instant feedback and better learning experience to the students. On the other hand, evaluation of learners' performance is essential for user modelling.

The second paper, 'Assessment of student competency for personalised online learning using objective distance', proposes the objective distance to measure the gap between current status of student's competency to the satisfied competency level required

for accomplishing the entire course. The technique proposed is useful for personalised learning. For example, it can assist learners to identify areas for improvement and recommend learning contents.

Relevant techniques and tools are required for effective analysis of learning data. For example, network analysis is to discover relations among learners in an online learning community. It can also detect and understand patterns of learning behaviour and interactions (Gruzd et al., 2016) in a collaborative learning environment. The third paper, 'A gender-based investigation of the determinants for information sharing in an open learner model environment', studies learners' behaviours in collaborative learning environments. In particular, it investigates the gender difference on perceived usefulness, perceived ease of use, trust and learners' information sharing intention in an open learner model-based collaborative learning environment. This paper provides useful information for designing collaborative learning systems.

Learning analytics can be performed at different scales, namely, course-level, institution-level and nation-level. The fourth paper 'An architecture for e-learning infrastructures on a national level: a case study of the Afghanistan Research and Education Network' discusses heterogeneous network which allows sharing of e-learning resources between organisations. The network also provides an infrastructure to support learning analytics at the nation-level.

The fundamental goal of user modelling is customisation and adaptation of systems in order to provide users with experiences fitting their specific background knowledge and objectives. The system needs to say the 'right' thing at the 'right' time in the 'right' way (Fischer, 2001). Personalised learning is developed based on user modelling and has become a trend in e-learning. Personalised learning systems collect personal data associated with a specific leaner and recommend learning activities accordingly. The remaining three papers illustrate application of user modelling in personalised learning.

The fifth paper, 'Modelling second language learners for learning task recommendation', presents a live example of user modelling. The paper describes a framework for word learning systems to automatically identify the context familiarity of individual learners based on their logs and construct their user models. Subsequently, incidental word learning tasks will be recommended based on user models. A personalised recommender for e-learning resources can enhance the effectiveness of learning.

The sixth paper, 'Topic-aware staff learning material generation in complaint management systems', evaluates staff members' complaint-handling skills by analysing historical data in a complaint management system. Subsequently, the system identifies highly skilled staff members and recommends complaint cases for staff training. The technique is usefully for automatic development of e-learning resources.

The seventh paper, 'Automatic exercise sequencing-based algorithmic skills', presents a technique for automatic sequencing exercises based on user profile, educational objectives, and semantic and pedagogical descriptions. Dynamic generation of a list of exercises can provide a personalised study path for an individual learner based on his/her competency. Selection of exercises based on the students' past performance can enhance students' learning experience.

The seven papers in this special issue address various issues in learning analytics and user modelling. We would like to thank Dr. Kongkiti Phusavat, the Editor-in-Chief of the *International Journal of Innovation and Learning*, for his kind acceptance of publishing

this special issue. We also would like to express our appreciation to Miss Barbara Curran for her efforts in assisting the publication of this special issue.

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