

6th International Workshop on Personalization Approaches in Learning Environments (PALE 2016) Preface

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ABSTRACT

Personalization approaches in learning environments are crucial to foster effective, active, efficient, and satisfactory learning. The focus of the PALE workshop series is on the different and complementary perspectives in which personalization can be addressed in learning environments (e.g., informal, workplace, lifelong, mobile, contextualized, and self-regulated learning) and offers an opportunity to present and discuss a wide spectrum of issues and solutions. In particular, this sixth edition includes 12 papers dealing with emotional engagement, affective states, personality, deep learning and complex skills, learning analytics and recommendations, educational data mining, lifelong learning, open learner models, as well as adaptive MOOCs.

CCS Concepts

• Education → Interactive learning environments • World Wide Web → Personalization • Users and interactive retrieval → Personalization.

Keywords

Personalization; Adaptive educational systems; Learning environments.

1. INTRODUCTION

The 6th International Workshop on Personalization Approaches in Learning Environments (PALE)¹ took place on July 16th, 2016 in Halifax (Canada) and was held in conjunction with the 24th ACM conference on User Modeling, Adaptation, and Personalization (UMAP 2016).

Since PALE topic can be addressed from different and complementary perspectives, PALE workshop series aims to offer a fruitful crossroad where interrelated issues can be contrasted and discussed. PALE 2016 was a follow-up of the five previous editions of PALE (which took place at UMAP 2011 – 2015) whose main contributions are compiled in the Special Issue on User Modelling to Support Personalization in Enhanced Educational Settings published by the International Journal of

Artificial Intelligence in Education [1]. As a long-standing workshop series, PALE workshop has established itself as a mature channel for disseminating research ideas about personalization in learning environments. This could not be possible without the very much appreciated involvement of the program committee members (many of them supporting PALE all along these years) as well as the active participation of authors who have selected this venue to disseminate and discuss their research.

From the past experience we have identified new areas of interest in this research scope to complement the previous ones. Thus, in this workshop edition we focused on sharing and discussing the new trends in current research on how user modeling and associated artificial intelligent techniques are able to contextualize and manage the increasing amount of information coming from the task at hand and its surrounding environment in order to provide the personalization support in a wide range of learning environments, which are increasingly more sensitive to the learners and their context. This covers many interrelated fields such as: intelligent tutoring systems, learning management systems, personal learning environments, serious games, agent-based learning environments, among others.

In order to foster the sharing of knowledge and innovative ideas on these issues, PALE format follows the Learning Cafe methodology to promote discussions on open issues regarding personalization in learning environments. Four Learning Café sessions were set up for this year PALE edition. Each one consisted of brief presentations of the key questions posed by three workshop papers and subsequent small group discussions with participants randomly grouped at tables. Each table was moderated by the presenter of the paper. During the session, participants changed tables to promote sharing of ideas among the groups. The workshop ended with a summary of the discussions on each paper. In this way, participants attending the workshop could benefit both from interactive presentations, constructive work, and knowledge sharing.

In the following, we introduce PALE 2016 motivation and themes as well as present an overview of the contributions accepted and discussed in the workshop.

¹ <http://adenu.ia.uned.es/workshops/pale2016/>

2. MOTIVATION

The target audience of the PALE workshop includes researchers, developers, and users of personalized and adaptive learning environments. Personalization is crucial to foster effective, active, efficient, and satisfactory behavior in learning situations in an increasing and varied number of contexts, which includes informal learning scenarios that are being demanded in everyday life activities and lifelong learning settings, with more control on the learner side and more sensitivity towards context. Personalization of learning environments is a long-term research area, which evolves as new technological innovations appear.

Nowadays there are new opportunities for building interoperable personalized learning solutions that consider a wider range of data coming from varied learner situations and interaction features (in terms of physiological and context sensors). However, in the current state of the art it is not clear how the new information sources are to be managed and combined in order to enhance interaction in a way that positively impacts the learning process whose nature is essentially adaptive.

In this context, suitable user modeling is needed to understand both realistic learning environments cropping up in a wider range of situations and the needs of the learners within and across them. There are new open issues in this area, which refer to detecting and effectively managing personal and context data in an increasing and varied range of learning situations in order to provide personal assistance to the learner, which can also take into account their affective state. This requires enhancing the management of an increasing number of information sources (including wearables) and big data which ultimately are to provide a better understanding of every person's learning needs within different contexts and over short-, medium-, and long-term periods of time.

This will hopefully increase learner's understanding of their own needs in terms of open learner models that are to be built from standards that support interoperability and which are to cover an extended range of available features, thus allowing for combining different external learning services as well as taking advantage of the integration of an increasing amount of information sources coming from ambient intelligence devices to gather information not only about the learner interaction, but the whole context of the learning experience. In this way, the learner modeling involves analyzing changing situations in terms of context, learners' needs and their behavior, requiring personal and collective management of the information available.

The focus of this workshop series is put on the different and complementary perspectives in which personalization can be addressed in learning environments (e.g., informal, workplace, lifelong, mobile, contextualized, and self-regulated learning). Previous editions have shown several important issues in this field, such as behavior and embodiment of pedagogic agents, suitable support of self-regulated learning, appropriate balance between learner control and expert guidance, design of personal learning environments, contextual recommendations at various levels of the learning process, tracking affective states of learners, harmonization of educational and technological standards, processing big data for learning purposes, predicting student outcomes, adaptive learning assessment, and evaluation of personalized learning solutions. PALE workshop offers an opportunity to present and discuss a wide spectrum of issues and solutions.

At this sixth edition, we were especially interested in the enhanced sensitivity towards the management of vast data coming from learners' interactions (e.g., sensor detection of affect in context) and technological deployment (including web, mobiles, tablets, tabletops), and how can this wide range of situations and features impact on modeling the learner interaction and context. Furthermore, we aimed to cover the every time more demanding need of personalized learning in wider contexts ranging from daily life activities to massive open online courses (MOOCs).

The higher-level research question addressed in this edition was: "Which approaches can be followed to cater for the increasing amount of information available from immediate (e.g., in terms of wearable devices) to broader contexts in order to provide effective and personalized assistance in learning situations?" This question has been considered in various contexts: interactive, personal, and inclusive learning environments.

PALE 2016 edition included (but was not limited to) the following topics related to personalization of learning environments:

- Affective computing
- Big data in education
- Personal and context modeling
- Data processing within and across learning situations
- Ambient intelligence
- Personalization in MOOCs
- Learning recommendation and explanations
- Learner and context awareness
- Cognitive and meta-cognitive scaffolding
- Social issues in personalized learning environments
- Open-corpus educational systems
- Adaptive mobile learning
- Reusability, interoperability, scalability
- Evaluation of adaptive learning environments
- Wearable devices for sensing and acting in ubiquitous learning scenarios
- Inclusive and adaptive education

3. CONTRIBUTIONS

A peer-reviewed process has been carried out to select the workshop papers. Three members of the Program Committee with expertise in the area have reviewed each paper. As a result, 12 submissions (out of 16) were accepted, which discuss ideas and progress on several interesting topics, such as emotional engagement, affective states, personality, deep learning and complex skills, learning analytics and recommendations, educational data mining, lifelong learning, open learner models, and adaptive MOOCs.

Arroyo et al. [2] present results of a randomized controlled study that compared different types of affective support messages delivered by pedagogical agents. Results suggest that using a character that is empathic and emphasizes the malleability of intelligence and the importance of effort provides useful results on

student learning, while reducing boredom and anxiety. Emphasizing success and failure appears to be detrimental to learning and interest and promotes anxiety.

Alyuz et al. [3] focus on the problem of emotional engagement through a personalized and multi-modal approach, and propose to detect important affective states of a learner in real time. The results show that for instructional sections, generic appearance classifier yields higher accuracy; whereas context-performance classifier is more accurate for assessment sections. Moreover, the results indicate that expression of engagement is person-specific through both of these sources, and personalized engagement models perform more accurately.

Gimenez et al. [4] deal with the use of low cost and low intrusive devices to gather contextual data to loosely drive the actions of an Intelligent Tutoring System (ITS) without constructing a fully structured model of the student and their corresponding affective and behavioral states. The idea is to improve the learning outcome and satisfaction of the student by progressively learning how to adapt the ITS in terms of the sensed data.

Huang et al. [5] explore modeling student knowledge in complex learning activities where multiple skills are required at the same time, such as in the programming domain. Their experiments show that the proposed model, based on skill combination patterns, significantly increases mastery inference accuracy and more reasonably distributes students' efforts comparing with traditional Knowledge Tracing models and their non-hierarchical counterparts. It is a step towards building skill application context sensitive model of students' deep, robust learning.

Okpo et al. [6] investigate what characteristics can be considered for the selection of the exercise for learners and how humans adapt exercise selection to learner personality and performance, so that an ITS can tailor exercise difficulty to these characteristics. Participants were shown an example of exercises, which would be given to learners, and asked to select the exercise which they thought the learner should do next. They responded based on the personalities of the learners as well as their past performances.

Alhathli et al. [7] investigate the influence of learner personality. In particular, it describes a study in the language learning domain that explores the relation between learners' extroversion and the extent to which learning materials are perceived to be enjoyable and to increase their confidence and skills. They found positive correlations between extroversion and these criteria for social and active learning materials.

Vozniuk et al. [8] address the problem of knowledge discovery by providing content and people recommendations based on user interests. To build a user interests profile automatically, they propose an approach by combining content analytics and activity tracking. The conducted preliminary evaluation demonstrated an ability of the approach to identify interests relevant to the user and to recommend relevant content.

Kickmeier-Rust [9] aims at developing a practical web platform that hosts tools for a theory-based approach to learning analytics. It offers tools to open and negotiate learner models using big data technologies aimed to meet the practical requirements of teachers or to really mirror human learning processes.

Alexandron et al. [10] focus on developing a general method for identifying cheaters in MOOCs in a way that does not assume a particular method of cheating. They develop a classification model that takes as input a set of features that operationalize

performance and behavioral parameters that are known to be associated with cheating. These include students' ability, the level of interaction with the course resources, solving time, and Item Response Theory person fit parameters.

Montes García et al. [11] show how the integration of a Content Management System with an adaptive framework simplifies the inclusion of personalization in existing educational applications. The use of their Within Browser Adaptation Framework (WiBAF) reduces privacy concerns, because the user model is stored on the end-user's machine. It also eliminates performance issues that currently prevent the adoption of adaptivity in MOOC platforms by having the adaptation performed within the browser.

Gilliot et al. [12] propose to explore the feasibility of personal information manager systems in the Open Learner Model (OLM) context that allows the control of personal learning data by learners themselves, its persistence and privacy. They focus on a relevant technical infrastructure giving full personal control to users without any specific competency, in order to manage long-term OLM, i.e. in lifelong and life wide perspectives.

Ishola and McCalla [13] propose an approach for supporting the lifelong professional learner. It adapts as the learner and the knowledge base change. They use data from social media to diagnose the gaps in the learner's knowledge. The authors also try to determine what the learners know about what they know and do not know. Finally, they track how the domain of expertise is changing. The goal is to build an OLM system, wherein the gaps in the knowledge of professionals can be indicated to them at any point in time while providing personalized help also.

4. CONCLUSIONS

In this 6th edition of PALE contributions addressed several gaps identified in the state of the art, including emotional engagement, affective states, personality, deep learning and complex skills, learning analytics and recommendations, educational data mining, lifelong learning, open learner models, and adaptive MOOCs.

Nevertheless, there are many issues that remain open, such as the integration of ambient intelligence devices to gather information about the learner state while interacting in a wider range of learning settings than the classical desktop computer approach, aimed to enhance the sensitivity towards learners' interactions through diverse technological deployments (including web, mobiles, tablets, and tabletops), impacting on modeling the learner with an extended set of features (e.g. affective state) derived from their interactions and given context. We expect that future editions in PALE can progress in these directions.

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