

Learning Analytics for Human-Centered Generative AI-Enhanced Smart Learning Environments Workshop

Pedro Manuel Moreno-Marcos^{1,*†}, Miguel L. Bote-Lorenzo^{2,†}, Patricia Santos^{3,†}, Carlos Delgado Kloos^{1,†}, Juan I. Asensio-Pérez^{2,†} and Davinia Hernández-Leo^{3,†}

¹Department of Telematic Engineering, Universidad Carlos III de Madrid, 28911 Leganés (Madrid), Spain, ROR: 03ths8210

²Department of Signal and Communications Theory and Telematic Engineering, Universidad de Valladolid, 47011 Valladolid (Valladolid), Spain

³Department of Information and Communication Technologies, Universitat Pompeu Fabra, 08018 Barcelona (Barcelona), Spain

Abstract

Smart Learning Environments (SLEs) are technology-enhanced learning systems designed to provide personalized and context-aware support to learners in hybrid learning scenarios, as well as to assist teachers in the process of designing effective learning experiences. This workshop aims to explore how Learning Analytics (LA) can advance Generative AI (GenAI)-enhanced human-centered SLEs. We will discuss how LA can support personalization, adaptive feedback, orchestration, and data-driven decision-making within SLEs while ensuring transparency, fairness, and human agency.

Keywords

Smart Learning Environments, Hybrid Learning, Generative AI, Human-Centered Design, Learning Analytics

Preface to the Workshop Proceedings

The Learning Analytics for Human-Centered Generative AI-Enhanced Smart Learning Environments Workshop (LA4GenAISLE) workshop took place on April 28th in Bergen (Norway). This workshop was a pre-conference event of the 16th International Conference of Learning Analytics and Knowledge (LAK26).

This workshop focused on Smart Learning Environments (SLEs), which are technology-enhanced learning systems designed to provide personalized and context-aware support to learners in hybrid learning scenarios, as well as to assist teachers in the process of designing effective learning experiences [1]. Particularly, the workshop aimed to explore how Learning Analytics (LA) can advance Generative AI (GenAI)-enhanced human-centered SLEs. We discussed how LA can support personalization, adaptive feedback, orchestration, and data-driven decision-making within SLEs while ensuring transparency, fairness, and human agency. The specific topics addressed in the workshop were as follows:

- LA in agentic architectures for GenAI-enhanced SLEs.
- Incorporating contextual data into GenAI-based LA.
- LA and GenAI for reducing teacher orchestration load in SLEs.
- LA fostering agency in GenAI-enhanced SLEs.

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*Corresponding author.

†These authors contributed equally.

✉ pemoreno@it.uc3m.es (P. M. Moreno-Marcos); migbot@uva.es (M. L. Bote-Lorenzo); patricia.santos@upf.edu (P. Santos); cdk@it.uc3m.es (C. Delgado Kloos); juaase@uva.es (J. I. Asensio-Pérez); davinia.hernandez-leo@upf.edu (D. Hernández-Leo)
🌐 <https://www.it.uc3m.es/pemoreno/> (P. M. Moreno-Marcos); <https://portaldelaciencia.uva.es/investigadores/181437/detalle> (M. L. Bote-Lorenzo);

https://www.upf.edu/web/tide/people/-/asset_publisher/YiQ7JITpGNAQ/content/santos-rodriquez-patricia/maximized (P. Santos); <https://www.it.uc3m.es/cdk/> (C. Delgado Kloos); <https://www.gsic.uva.es/personal/juaase> (J. I. Asensio-Pérez); <https://www.upf.edu/web/davinia-hernandez-leo> (D. Hernández-Leo)

🆔 0000-0003-0835-1414 (P. M. Moreno-Marcos); 0000-0002-8825-0412 (M. L. Bote-Lorenzo); 0000-0002-7337-2388 (P. Santos); 0000-0003-4093-3705 (C. Delgado Kloos); 0000-0002-1114-2819 (J. I. Asensio-Pérez); 0000-0003-0548-7455 (D. Hernández-Leo)



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- GenAI-based student models.
- Connecting Learning Design information with AI-generated LA indicators.
- Using LA and pedagogical intentions to drive GenAI behaviour.
- Leveraging past learning data to evaluate GenAI-based Interventions in LA.
- Using LA to advance ethical and responsible AI practices in SLEs.
- Human-centered research and educational technology design methods.

For this workshop, a Call for Paper was published to collect papers that addressed the aforementioned topics and served as a starting point for a discussion afterwards. The papers were reviewed by at least two reviewers using double-blinded peer review. The program chairs, as experts in SLEs, LA and AI in education, made the final decisions on acceptance. A total of seven papers were submitted to this workshop, and six of them were accepted and presented in the workshop. These six papers are published in this LA4GenAISLE Workshop Proceedings after addressing the issues raised by reviewers.

Accepted papers were presented at the workshop and their presentations included a specific mention of the challenges related to GenAI-enhanced SLEs that were addressed in their papers in relation to the workshop topics. These presentations served as the starting point for a collaborative discussion among participants. Participants were divided into two groups and first reflected on the workshop topics before identifying associated challenges and possible solutions.

The first group focused on the role of contextual data in LA for GenAI, the use of LA and pedagogical intentions to guide GenAI behaviour, the development of AI-supported student models, and the use of historical learning data to evaluate AI-enabled interventions. The discussion highlighted challenges associated with data collection processes, including the diversity and quality of collected data, data alignment and transparency, and the need to foster trust so that students are willing to share their data. Participants also emphasized the importance of critical thinking in interpreting contextual information, concerns regarding surveillance and potential biases resulting from students being observed when using GenAI tools, and the acceptance of pedagogically customised chatbots. Furthermore, the group discussed the influence of contextual factors such as culture and age, as well as the implications of these technologies for teacher AI literacy and professional development.

The second group concentrated on human-centered research and educational technology design methods, LA in agentic architectures for GenAI-enhanced SLEs, and the role of LA in fostering learner agency. Their discussions underscored the importance of connecting Learning Design and Learning Analytics, as the interpretation of analytics indicators is highly dependent on pedagogical context. Participants explored how LA could support LLMs in suggesting adaptations to learning designs and how SLEs could become aware of pedagogical intentions. In particular, the group identified the need for a shared representation or common language, potentially through formal models or structured documents, to enable LLMs to mediate between pedagogical intentions and pedagogically agnostic learning environments.

Despite addressing different workshop topics, both groups converged on the importance of trustworthy and contextualized data, the alignment between LA and LD, and the need for human-centered approaches that preserve agency and transparency. The discussions also highlighted the necessity of developing shared representations that allow AI systems to understand pedagogical intentions and provide context-aware support to learners and teachers. Collectively, these challenges point towards a research agenda that integrates technical, pedagogical, and ethical perspectives in the design of future GenAI-enhanced Smart Learning Environments..

Program Chairs

- Pedro Manuel Moreno-Marcos, Universidad Carlos III de Madrid, Spain
- Miguel L. Bote-Lorenzo, Universidad de Valladolid, Spain
- Patricia Santos, Universitat Pompeu Fabra, Spain
- Carlos Delgado Kloos, Universidad Carlos III de Madrid, Spain
- Juan I. Asensio-Pérez, Universidad de Valladolid, Spain
- Davinia Hernández-Leo, Universitat Pompeu Fabra, Spain

Program Committee and Workshop Organizers

- Pedro Manuel Moreno-Marcos, Universidad Carlos III de Madrid, Spain
- Miguel L. Bote-Lorenzo, Universidad de Valladolid, Spain
- Patricia Santos, Universitat Pompeu Fabra, Spain
- Peter Brusilovsky, University of Pittsburgh, USA
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- Daniel Spikol, University of Copenhagen, Denmark
- Katrien Verbert, Katholieke Universiteit Leuven, Belgium
- Carlos Delgado Kloos, Universidad Carlos III de Madrid, Spain
- Juan I. Asensio-Pérez, Universidad de Valladolid, Spain
- Davinia Hernández-Leo, Universitat Pompeu Fabra, Spain

Additional Reviewers

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- Yuyang Guo, The University of Hong Kong, Hong Kong
- Oktay Ozan Güner, Universitat Pompeu Fabra, Spain
- Zeynab Mohseni, Universidad de Valladolid, Spain
- Wannapon Suraworachet, University College London, United Kingdom
- Qi Zhou, University College London, United Kingdom

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