



IEEE TC-ILE Workshop: Bridging Extended Reality and Artificial Intelligence in Immersive Learning

Andreas Dengel and Alexander Steinmaurer

¹ Goethe University Frankfurt, Frankfurt (Main), Germany

² Interdisciplinary Transformation, Linz, Germany
dengel@uni-frankfurt.de

Abstract. The IEEE TC-ILE workshop on "Bridging Extended Reality and Artificial Intelligence in Immersive Learning" at iLRN 2024 aims to explore the integration of virtual reality (VR) and augmented reality (AR) with cutting-edge artificial intelligence (AI) techniques, including machine learning, large language models, and generative AI for image and 3D model creation. This innovative workshop seeks to unite researchers, educators, and technologists to form specialized working groups. These groups will delve into various AI methodologies and assess their potential in enhancing immersive learning experiences. Specifically, the workshop will focus on crafting engaging and effective learning scenarios for K-12 and higher education across different subjects. By harnessing the synergy between extended reality (XR) technologies and AI, the workshop endeavors to push the boundaries of educational paradigms. The culmination of this collaborative effort will be a comprehensive whitepaper, summarizing the findings and recommendations, to be published on the iLRN webpage and disseminated through the TC-ILE quarterly newsletter.

Keywords: Immersive Learning, Artificial Intelligence, Augmented Intelligence.

1 Introduction

The fusion of Artificial Intelligence (AI) with Extended Reality (XR), including Virtual Reality (VR) and Augmented Reality (AR), represents a frontier in the evolution of immersive learning environments. This combination is particularly compelling due to the unique strengths each technology brings to the educational landscape [1]. AI, with its capabilities in data analysis, pattern recognition, and generative content creation, offers the tools to personalize learning experiences, adapt to individual learner needs, and generate dynamic, interactive content. On the other hand, XR technologies provide immersive, engaging environments that can simulate real-world scenarios or visualize abstract concepts, making learning more intuitive and impactful [2]. The research area Immersive Education investigates the process of learning in these environments by studying "the educational benefits provided by artificial experiences that are perceived as non-mediated". Interdisciplinary expert discussions on capabilities to create, alter or enhance these experiences through artificial intelligence could contribute to the body of knowledge in Immersive Learning, Immersive Teaching, and Immersive Education [3].

Integrating AI with XR opens up unprecedented opportunities for educational innovation. AI can enhance XR environments with intelligent feedback systems, adaptive learning paths, and automated content generation, creating experiences that are not only deeply engaging but also highly individualized. This synergy can transform traditional learning models, making education more accessible, effective, and tailored to the needs of diverse learners. For instance, AI-driven analytics within VR simulations can offer real-time insights into student performance and learning behaviors, enabling educators to fine-tune interventions and support. Meanwhile, AR applications powered by AI can overlay contextual, interactive information onto the physical world, enriching the learning experience with a layer of digital interactivity that responds to the learner's environment and actions.

2 Workshop Phases

The workshop is structured to facilitate a comprehensive exploration and collaborative discussion on integrating AI with XR technologies, especially in the various levels of classroom interaction [4] as well as on scientific terminology, methodologies, and theoretical approaches, frameworks, and models in order to contribute to the “branches” of the Immersive Knowledge Tree project [5], by extending the fields of inquiry as well as research priorities. The workshop is divided into three distinct phases, each designed to maximize participant engagement, knowledge exchange, and outcome generation.

- 1) The initial phase, the XR/AI showcase, serves as an immersive introduction to the current state of AI and XR integration. Participants will share their research, projects, and developments in XR technologies enhanced with AI through a Gallery Walk. This interactive format allows attendees to circulate around the room, engaging with the presented works, fostering an environment of inspiration and setting the stage for in-depth discussions on the potential of these technologies in immersive learning.
- 2) Following the showcase, participants will divide into small groups to delve into the possibilities of AI and XR within immersive learning environments. Utilizing the Jigsaw Technique, each group will focus on a specific aspect or technique of AI in XR, encouraging detailed exploration and cross-pollination of ideas. Where possible, specific AI technologies will be used as an example for the discussions. This phase is designed to stimulate collaborative thinking and generate diverse insights on how these technologies can be applied across various learning scenarios, particularly in K-12 and higher education.
- 3) The final phase of the workshop is dedicated to sharing the outcomes of the group sessions. Each group will present their findings, discussions, and potential applications of AI and XR in immersive learning. This collaborative synthesis not only highlights the workshop's collective intelligence but also lays the groundwork for the subsequent whitepaper. The presentations will segue into planning for the whitepaper, detailing the structure, content, and contribution process to ensure that the insights and recommendations generated during the workshop are effectively documented and shared with the broader community via the iLRN webpage and the TC-ILE quarterly newsletter.

These phases (see Table 1) are meticulously designed to ensure that the workshop not only serves as a platform for sharing existing knowledge and projects but also as a catalyst for innovative ideas and future collaborations in the realm of AI-enhanced immersive learning. The workshop aims to structure existing approaches into a form of “Immersive Intelligence”, where the capabilities of AI and Immersive Learning are combined into new educational approaches.

Table 1. Phases of the Workshop.

Time	Phase	Method
20 minutes	AI/XR Showcase. Workshop participants share their research and projects on XR with AI	Gallery Walk
45 minutes	Group Sessions. The participants gather in groups and engage in discussions about the potentials of bridging AI and XR and its capabilities for Immersive Learning scenarios	Jigsaw Technique
25 minutes	Presentation. Presentation of the results from the different groups in different topics, planning for the whitepaper.	Presentation

References

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