Augmented Reality (AR) in Medical Training:

AI-Powered Simulations for Enhanced Learning Experiences

Selin Kılıç
School Without Walls & The George Washington University

***Abstract*—Medical training has historically relied on traditional pedagogical approaches, including textbooks, cadaver dissections, and supervised clinical experiences. However, the emergence of Augmented Reality (AR) integrated with Artificial Intelligence (AI) is transforming medical education by offering immersive, interactive, and adaptive learning environments. AI-powered AR simulations provide real-time feedback, predictive analytics, and personalized learning pathways, thereby enhancing skill acquisition, decision-making capabilities, and procedural proficiency. These systems can replicate complex surgical procedures, anatomical explorations, and diagnostic assessments with high fidelity, reducing the dependency on physical resources and mitigating patient risk. Furthermore, AI-driven AR applications facilitate collaborative learning, enabling remote training and standardized assessments. The integration of AR and AI fosters a dynamic educational paradigm that enhances knowledge retention and practical competence, ultimately contributing to improved healthcare outcomes. This paper explores the technological advancements, pedagogical benefits, and future prospects of AI-powered AR simulations in medical training, emphasizing their potential to revolutionize medical education and clinical practice.**

The field of medical education is undergoing a significant transformation, driven by the rapid advancement of digital technologies. Traditional methods of medical training, while foundational, often fall short in addressing the evolving demands of modern healthcare systems. The complexities of human anatomy, the precision required in surgical procedures, and the dynamic nature of medical diagnosis necessitate innovative training methodologies that extend beyond conventional learning paradigms. Augmented Reality (AR), augmented by Artificial Intelligence (AI), has emerged as a revolutionary tool in medical education, offering immersive, real-time, and interactive learning experiences that enhance both theoretical understanding and practical competencies.

Digital Object Identifier 10.62802/wjqdd546

Date of publication 01 08 2024; date of current version 01 08 2024

AR superimposes digital content onto the real world, creating an enriched learning environment where students and practitioners can interact with three-dimensional anatomical models, simulate surgeries, and engage with virtual patients in a risk-free setting. When integrated with AI, these simulations become intelligent, offering personalized learning pathways, real-time performance assessments, and predictive analytics to optimize skill development. AI algorithms can analyze user performance, identify weaknesses, and tailor training modules accordingly, ensuring competency-based progression. Such an approach not only enhances the efficacy of medical training but also reduces reliance on cadaver-based dissections and live patient interactions, addressing ethical and logistical constraints.

Published by the ABA Yayıncılık