Smart Libraries in Smart Education: Integrating AI Technologies for Personalized Learning Support

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Abstract

The convergence of artificial intelligence (AI) and library science has catalyzed the emergence of a new paradigm: the smart library—a dynamic, data-driven ecosystem capable of adapting to learners' individual needs in real time. This article examines how AI technologies, including machine learning, natural language processing (NLP), intelligent recommendation systems, chatbot-assisted reference services, and adaptive learning platforms, are being integrated into academic and public library infrastructures to support personalized learning. Drawing on peer-reviewed literature, institutional case studies, and emerging theoretical frameworks, the paper argues that smart libraries represent a fundamental transformation in how knowledge is curated, accessed, and pedagogically leveraged within smart education environments. The study explores the technical architecture of AI-enabled library systems, their pedagogical implications, ethical considerations surrounding data privacy and algorithmic bias, and the challenges of implementation across diverse institutional contexts. Findings suggest that while AI-enhanced libraries significantly improve learning outcomes, engagement, and resource discovery efficiency, their success depends on equitable design principles, robust digital infrastructure, and ongoing collaboration between library professionals, educators, and technology developers. The article contributes an integrated conceptual model—the Smart Library Learning Ecosystem (SLLE)—as a framework for understanding and guiding the development of next-generation library services in the context of smart education.