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Personalized Learning and Adaptive Systems in Education: A Comprehensive Bibliometric Analysis

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Abstract

Personalized learning and adaptive learning have emerged as pivotal paradigms in 21st-century education, driven by the integration of artificial intelligence and learner-centered technologies. Despite the rapid growth of scholarly contributions in this domain, a comprehensive synthesis that captures its thematic, temporal, and geographic dynamics has remained lacking. This study aims to map the research landscape of personalized and adaptive learning from 2001 to 2025 through a bibliometric analysis of 922 peer-reviewed documents sourced from the Scopus database. Utilizing bibliometric mapping tools including VOSviewer and Biblioshiny, the study analyzed publication trends, source impact, authorship, international collaboration, keyword co-occurrence, and thematic evolution. The findings reveal a significant surge in publications post-2015, peaking in 2023, indicating an intensifying global focus on individualized educational systems. Key dissemination venues include *Lecture Notes in Computer Science*, *IEEE Access*, and the *ACM International Conference Proceeding Series*. Influential contributors such as Hwang G.-J., Lin F., and Rezai A. were identified, along with a geographic concentration of output in China, the United States, and India. Keyword analysis highlights a transition from early emphases on "learning styles" to recent themes such as "ChatGPT," "reinforcement learning," and "inclusive education." This study offers a longitudinal and multi-dimensional overview of the field, integrating diverse data points into a coherent intellectual narrative. The results serve as a strategic reference for scholars, policymakers, and practitioners, informing future research, innovation, and policy direction in the development of intelligent and adaptive learning environments.