Chapter 4
Evaluating the Role of Artificial Intelligence in Learning Analytics

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ABSTRACT

This chapter examines the role of artificial intelligence in learning analytics, exploring its theoretical, technical, interdisciplinary, and institutional dimensions. First, the cognitive and data-driven foundations of the field are introduced, and then the capabilities of AI in personalizing learning, providing real-time feedback, and educational decision-making are analyzed. Interdisciplinary applications are then examined, with an emphasis on the connection with cognitive science, linguistics, and UX design. The scalability challenges and institutional impacts of learning analytics at the educational policy level are also discussed. The conclusion shows that the effective use of AI requires synergy between humans, technology, and institutional structures.

1- INTRODUCTION

In recent years, the field of education has undergone a fundamental transformation; a transformation that, with the emergence of data-driven technologies and artificial intelligence, has crossed the traditional boundaries of learning and has confronted classical concepts of education with new questions. One of the important consequences of this transformation is the emergence of a new branch called Learning Analytics; a branch that is based on the collection, processing, and interpretation of

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data related to the behavior and performance of learners and its goal is to optimize the teaching-learning process (Movahed, Movahed, & Nozari, 2024). In such an environment, the entry of artificial intelligence as a powerful analytical engine seems not only inevitable but also mandatory. Artificial intelligence makes it possible to extract meaningful patterns from the mass of learning data; patterns that would be difficult or impossible for humans to understand alone.

The convergence between learning analytics and artificial intelligence has emerged in response to two fundamental needs in education: first, the need for a deeper and more accurate understanding of each individual's learning path; Second, the need for evidence-based educational decision-making, not just intuition. If we consider education to be a complex and multifaceted process that depends on cognitive, psychological, social, and contextual factors, then understanding and analyzing it also requires tools that can model and manage this complexity. Artificial intelligence plays a facilitating and interpretive role in this, especially when combined with machine learning algorithms, neural networks, or educational recommender systems (Nozari & Ghahremani-Nahr, 2023).

However, before we explore the capabilities of AI in learning analytics, it is necessary to review the fundamental concepts of both fields. Learning analytics, simply put, is the process of using learning data to better understand learner behavior, improve content, predict performance, and provide targeted feedback. This data may be extracted from a variety of sources, such as virtual learning environments, learning management platforms, online tests, or even social interactions in the digital space (Movahed, Movahed, & Nozari, 2024). In contrast, artificial intelligence is a set of technologies and algorithms designed to simulate human cognitive abilities. When these two fields come together, a platform is provided in which education moves from a static and general state to a dynamic, personalized and adaptable process.

One of the main reasons for addressing the role of artificial intelligence in learning analytics is the shift in the paradigm of education from static models to adaptive learning approaches. Today, one can no longer expect the same output from the same curriculum for all learners. Instead, new approaches seek to design flexible and data-driven learning paths; paths that can adapt to the needs and individual abilities of the learner through continuous analysis of his performance. In such a model, the role of AI goes beyond mere data analysis and is elevated to the level of making recommendations, supporting decision-making and even designing learning paths (Nozari, Szmelter-Jarosz, & Ghahremani-Nahr, 2021).

Furthermore, the shift in the education landscape from traditional education to lifelong learning has made the need for intelligent analytics more pressing. In environments where learners learn independently and within self-directed pathways, human supervision and support will be difficult and limited. This is where AI can play a key role in supporting learners by analyzing learning trends, identifying per-