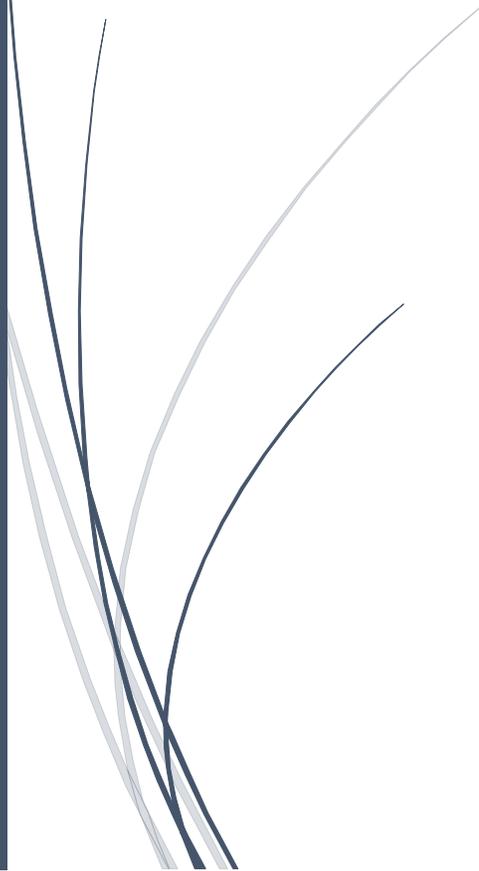RADemics

AI-Based English Reading Proficiency Assessment Models

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Abstract

Advancements in artificial intelligence have significantly transformed the evaluation of English reading proficiency, enabling precise, adaptive, and personalized assessment models. This chapter explores the integration of AI techniques including machine learning, deep learning, and natural language processing with multimodal data sources such as eye-tracking, keystroke dynamics, audio-visual signals, and wearable sensors to assess reading comprehension and cognitive engagement. The framework highlights adaptive assessment systems that dynamically adjust difficulty levels, provide targeted feedback, and design individualized learning pathways to enhance skill acquisition. Applications in K-12 education, higher education, ESL programs, standardized proficiency tests, and online learning platforms are examined, demonstrating improvements in accuracy, reliability, and learner engagement. Case studies reveal the practical benefits of AI-driven reading assessment, while discussions on challenges, ethical considerations, and future directions emphasize the importance of responsible implementation. The chapter establishes a comprehensive understanding of how AI-based models can redefine reading proficiency evaluation and promote evidence-based, learner-centered literacy development.

Keywords: Artificial Intelligence, Reading Proficiency, Adaptive Assessment, Natural Language Processing, Multimodal Data, Personalized Learning.

Introduction

Advancements in artificial intelligence have transformed the landscape of educational assessment, particularly in evaluating reading proficiency in English [1]. Traditional assessment methods rely heavily on standardized tests, structured exercises, and subjective scoring, which often fail to capture the full spectrum of learner abilities [2]. These conventional approaches typically focus on end-of-task accuracy rather than cognitive processes, comprehension strategies, or engagement levels [3]. AI-based assessment models address these limitations by incorporating data-driven methodologies that provide continuous, real-time insights into learner performance [4]. By leveraging computational algorithms, machine learning, and natural language processing, these systems can evaluate diverse reading skills with precision, scalability, and adaptability, offering a more comprehensive understanding of proficiency [5].

Machine learning and deep learning algorithms form the core of AI-driven reading assessment, enabling the classification, prediction, and scoring of learner responses across multiple dimensions [6]. Models such as BERT, RoBERTa, and GPT facilitate semantic and syntactic analysis of

textual inputs, capturing subtle nuances in comprehension, inference, and reasoning [7]. These systems can identify patterns that indicate specific reading challenges [8], such as difficulty with complex sentence structures or inferential reasoning, which may remain undetected in traditional assessments [9]. By integrating predictive modeling with linguistic feature extraction, AI frameworks provide detailed diagnostic insights that inform targeted interventions, personalized learning, and adaptive instructional strategies [10].

Multimodal approaches further enhance the depth and accuracy of assessment by incorporating behavioral, physiological, and interaction data [11]. Eye-tracking, keystroke dynamics, and wearable sensor inputs capture cognitive load, attention, and engagement patterns, complementing textual analysis with objective measures of learner effort [12]. Audio-visual inputs, including speech and facial expressions, allow evaluation of pronunciation, fluency, and affective responses [13]. The combination of these diverse data streams enables holistic assessment models that move beyond static scoring to analyze real-time reading behavior and cognitive processing [14]. Such multimodal integration improves both the reliability and validity of reading proficiency measurement [15].