

Abstract:

Identifying student knowledge gaps from handwritten answer scripts remains a significant challenge for educators. Providing personalized feedback is essential yet time-consuming. While substantial research has focused on automated grading, accurately pinpointing student knowledge gaps continues to be a complex issue. This research explores how Optical Character Recognition (OCR) and Natural Language Processing (NLP) can address this challenge.

By leveraging deep learning models, particularly Convolutional Neural Networks (CNNs), OCR is used to convert handwritten text into machine-readable digital text. Once digitized, NLP models process the text to analyze the content, extracting key concepts and evaluating the depth of student understanding. Techniques such as sentiment analysis, topic modeling, and entity recognition are employed to detect knowledge gaps and areas needing further instruction.

This study aims to enhance the efficiency and accuracy of handwritten assessment analysis, enabling educators to provide more timely, targeted feedback. Ultimately, this approach holds potential for improving educational outcomes by bridging knowledge gaps and fostering better learning experiences.

Introduction:

The increasing reliance on automated assessment technologies has led to growing interest in education, especially in identifying student knowledge gaps from handwritten responses. One of the most difficult tasks for educators is providing personalized feedback based on these handwritten answers. Despite advances in automated grading systems, accurately identifying knowledge gaps remains a persistent challenge.

While significant progress has been made in automated scoring, few studies focus on the specific issue of identifying knowledge gaps in handwritten responses. This gap in research limits the effectiveness of automated assessment tools in education. To address this, this study investigates the integration of Optical Character Recognition (OCR) and Natural Language Processing (NLP) to enhance the accuracy of identifying knowledge gaps in handwritten assessments.

We hypothesize that combining OCR and NLP technologies will significantly improve the ability to identify student knowledge gaps. In this study, we utilize deep learning models, particularly Convolutional Neural Networks (CNNs) for OCR, to convert handwritten text into machine-readable format. After digitization, NLP models process this text to evaluate student understanding, identifying gaps in knowledge.

The goal of this research is to provide deeper insights into the areas where students face challenges, allowing educators to deliver more precise and timely feedback. By transforming handwritten text into machine-readable format and applying advanced NLP techniques, we

can accurately identify knowledge gaps and recommend targeted interventions. This study has the potential to significantly improve educational practices and enhance student learning outcomes.

The paper is organized as follows: The introduction outlines the research problem, objectives, significance, and methodology. The literature review provides an overview of existing research in the field. The methodology section details the technical approach used in the study. The results and discussion sections present the findings and their implications. Finally, the conclusion summarizes the study's contributions and suggests future research directions.