



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 4, April 2025

Automated Answer Sheet Evaluation System using AIML

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ABSTRACT: The Automated Answer Sheet Evaluation System using AIML streamlines the process of evaluating subjective answer sheets by leveraging AI technologies. Using Optical Character Recognition (OCR), the system extracts both printed and handwritten answers from scanned PDFs. Natural Language Processing (NLP) and fuzzy keyword matching techniques are then applied to compare student responses with model answers and assign scores accordingly. A web-based interface built using React.js allows users to upload answer sheets and download evaluation reports in CSV format. This project significantly reduces manual grading time while ensuring fairness and accuracy.

KEYWORDS: OCR, NLP, Handwriting Recognition, Answer Sheet Evaluation, Fuzzy Matching, React.js, Flask API.

I. INTRODUCTION

Manual evaluation of subjective answer sheets is a tedious and time-consuming task that often suffers from human limitations such as fatigue, inconsistency, and bias. These issues become more pronounced when evaluating large volumes of answer sheets, leading to potential inaccuracies and unfair assessments. With the rapid evolution of Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP), automating this process has become both feasible and necessary to improve the speed, consistency, and reliability of evaluations.

The proposed system, Automated Answer Sheet Evaluation using AIML, addresses this challenge by automating the assessment of both printed and handwritten student responses. Using OCR tools such as PyMuPDF for printed text and EasyOCR with OpenCV preprocessing for handwriting, the system extracts text from scanned PDFs. It then applies NLP techniques like tokenization, stopword removal, and lemmatization to process the content. Fuzzy string matching algorithms (e.g., FuzzyWuzzy or RapidFuzz) are used to compare student answers with a model answer and assign scores based on similarity. To make the solution user-friendly, a React.js-based frontend enables users to upload answer sheets and view results, while a Flask backend handles all AI processing. This system not only reduces the manual effort involved in grading but also introduces a scalable, fair, and efficient method of subjective answer evaluation—making it ideal for educational institutions, online learning platforms, and corporate assessments.

II. LITERATURE SURVEY

The intersection of Optical Character Recognition (OCR), Natural Language Processing (NLP), and artificial intelligence has opened new avenues in the field of educational automation. Traditional answer sheet evaluation is highly dependent on human effort, making it prone to subjectivity, inconsistency, and significant time delays. Several existing systems aim to automate objective evaluation (e.g., multiple-choice grading), but subjective answer evaluation especially for handwritten text - remains a complex and less explored domain.

In [1], a method combining Tesseract with morphological operations for handwritten form recognition was explored, though it lacked semantic answer understanding. Recent studies have emphasized the importance of semantic similarity, not just keyword matching.

In [2], NLP-based grading systems used BERT embeddings to compare semantic meaning between model and student answers. While accurate, these models were computationally expensive and unsuitable for lightweight, scalable deployments. Alternatively, fuzzy string matching algorithms like FuzzyWuzzy and RapidFuzz provide a simpler, rule-based solution that can handle minor spelling errors and synonym usage. These techniques are often paired with tokenization and lemmatization to refine answer structure before comparison. OCR combined with NLP has also been used in intelligent tutoring systems.

In [3], researchers proposed combining OCR and NLTK for question-answer evaluation in e-learning environments, which proved effective but lacked robust interfaces for bulk processing. Several open-source platforms now support basic document parsing, but few offer end-to-end pipelines including image preprocessing, scoring, and result export in user-friendly formats such as CSV. While commercial tools like Gradescope partially automate the grading process, they typically rely on predefined templates or manual answer alignment. Our system differs by providing an AI-powered, template-free evaluation framework, which dynamically processes both printed and handwritten answers. The combination of OpenCV preprocessing, EasyOCR handwriting recognition, and NLP-driven fuzzy matching represents a novel yet practical approach for scalable and customizable evaluation systems.

III. METHODOLOGY

The Automated Answer Sheet Evaluation System using AIML follows a streamlined pipeline that starts with uploading the Model Answer Sheet and Student Answer Sheets through a web-based interface. The system supports both printed and handwritten formats, making it suitable for various educational setups. Once uploaded, the backend uses PyMuPDF for printed text and EasyOCR (with OpenCV preprocessing) for handwritten text extraction. The extracted content is then segmented into question-answer pairs using regular expressions. Natural Language Processing is applied using the NLTK library to clean and extract keywords via tokenization, stopword removal, and lemmatization.

The core evaluation is done using fuzzy matching techniques like FuzzyWuzzy, which compare student answers to the model answer and assign a score between 0 and 10 based on keyword similarity. React.js frontend displays the scores and provides an option to reset. This end-to-end AI-powered workflow ensures accurate, unbiased, and fast answer sheet evaluation.

IV. EXPERIMENTAL RESULTS

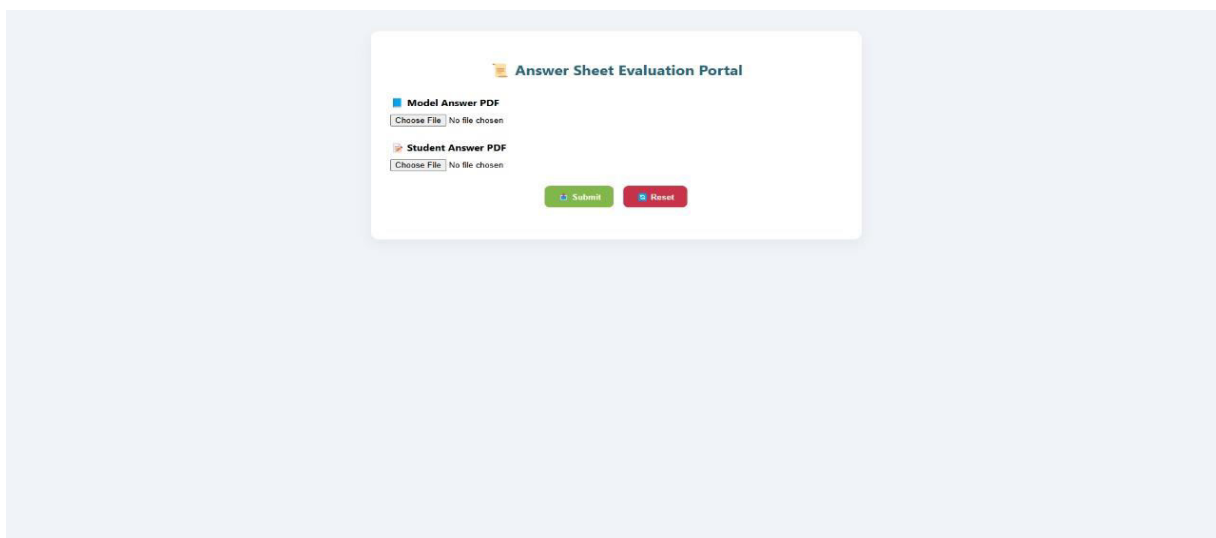


Figure 1(a) shows the initial interface of the system, where users are prompted to upload both the Model Answer Sheet and the Student's Answer Sheet in PDF format. The layout is simple and intuitive, allowing for drag-and-drop functionality or file browsing to select the appropriate documents. This interface initiates the automated evaluation process and serves as the entry point for users to interact with the system.

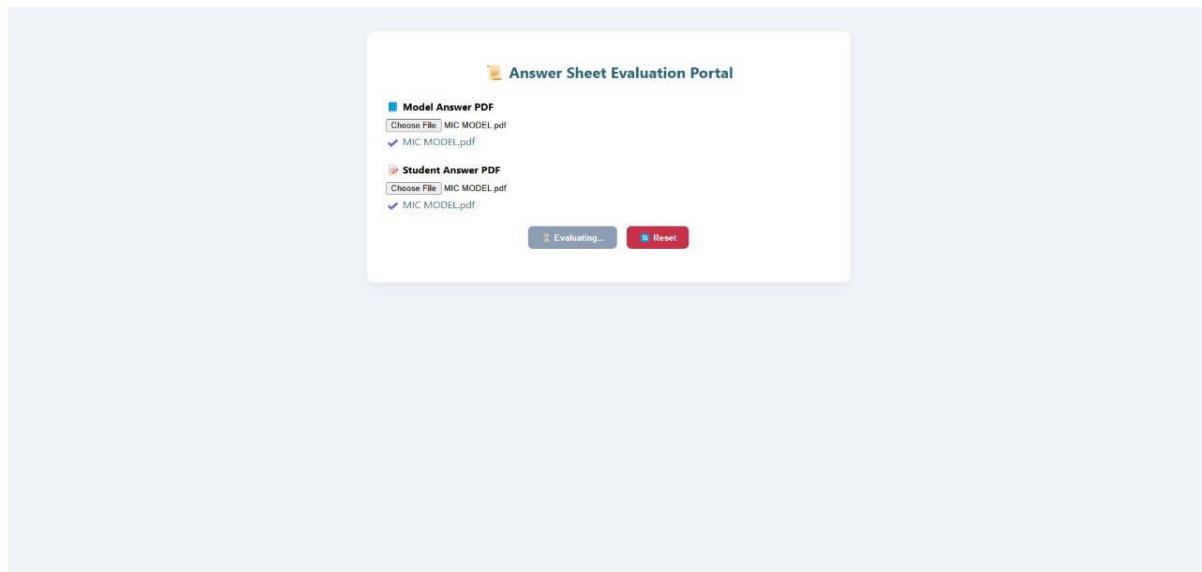


Figure 2(b) illustrates the internal evaluation process after the answer sheets have been uploaded. The backend uses OCR (EasyOCR for handwritten text and PyMuPDF for printed text) along with NLP preprocessing techniques to extract and compare the answers. The figure captures the intermediate stage where question-answer segmentation and keyword extraction are performed before fuzzy matching begins. This process ensures that student responses are fairly evaluated against the model answer.

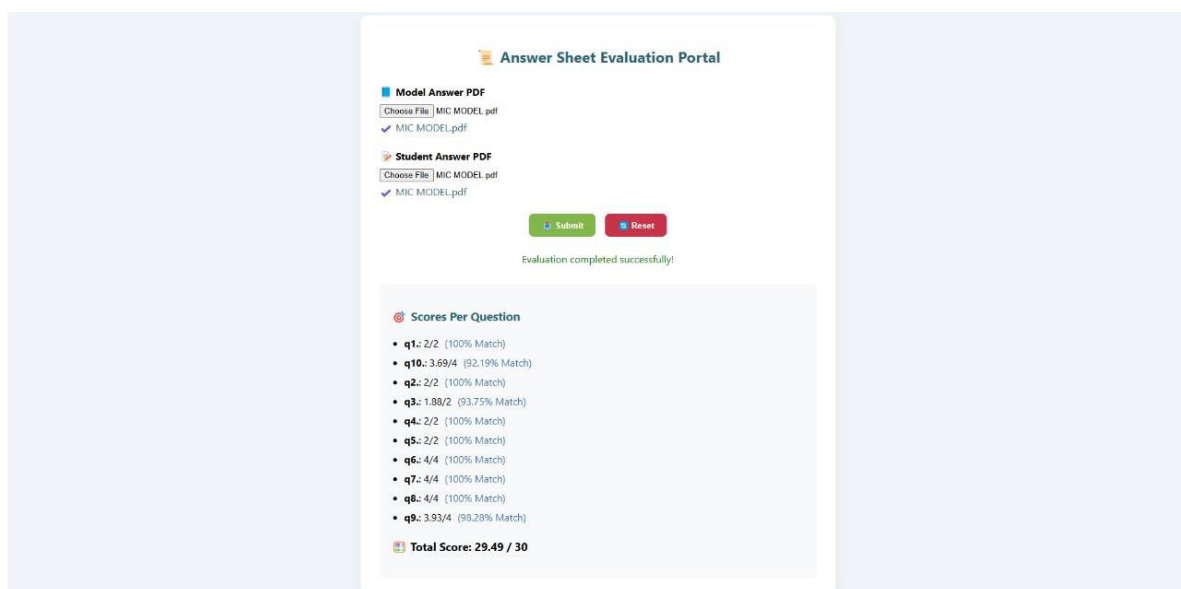


Figure 3(c) displays the final output of the system. After processing and comparison, the system assigns marks to each answer based on similarity with the model answer and presents the results. The output includes question-wise scores,

total marks, and an option to download the evaluation report as a CSV file. This confirms the successful completion of the automated grading cycle and highlights the efficiency and usability of the platform.

V. CONCLUSION

We have developed an AI-powered automated answer sheet evaluation system capable of extracting, processing, and scoring both printed and handwritten student responses. By integrating OCR, NLP, and fuzzy matching techniques, the system provides accurate and consistent evaluation of subjective answers when compared against a model solution. The platform has been tested with various formats of answer sheets and successfully demonstrated its ability to handle diverse handwriting styles and printed text. The integration of a React.js frontend with a Flask backend ensures a seamless user experience, allowing real-time result display. This system offers a scalable, efficient, and unbiased solution for educational institutions aiming to digitize and automate the grading process.

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