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AUTOMATED ANSWER SCRIPT EVALUATION

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ABSTRACT :

The system is a web app that tries to make grading exams easier by using AI tools. It lets teachers upload question papers along with reference answers and then handles scanned student scripts. Text gets pulled out using OCR especially for anything handwritten which seems important for real use.

From there the answers get checked with NLP and large language models that look at meaning and how relevant things are instead of just matching words. I think the RAG part pulls in reference material to help make the scoring better overall. Marks come out question by question and then by section with a total at the end plus some kind of report that can be downloaded.

The setup uses React on the front and Python with FastAPI in back along with a PostgreSQL database. Python tools handle the OCR and text analysis while the LLM works with RAG for the evaluation step. It cuts down on how much manual work is needed and probably saves time though faculty still get to look over the marks before anything is final. That review part might help keep things reliable but it is not totally clear how much it changes the process in practice.

KEYWORDS: The project utilizes Artificial Intelligence together with Retrieval-Augmented Generation (RAG) and Large Language Models (LLMs) to enhance its performance. The project uses Natural Language Processing (NLP) and Optical Character Recognition (OCR) to create an answer evaluation system for student work. The system performs answer evaluation through Semantic Similarity which enables Automated Grading of.

INTRODUCTION

Educational institutions need to perform manual evaluation of answer scripts for their educational assessment process. The evaluation process for multiple answer sheets requires faculty members to dedicate additional time and work. The manual process of answer checking and mark calculation creates potential for mistakes to occur. The evaluation process needs an automated system which will help staff members perform their work more quickly.

The Automated Answer Script Evaluation System operates as an intelligent web-based application which supports faculty members in their student answer evaluation work. The application operates through the combination of Artificial Intelligence (AI) with Natural Language Processing (NLP) and Optical Character Recognition (OCR) and Retrieval-Augmented Generation (RAG) and Large Language Models (LLMs) to perform answer evaluation. The application enables faculty members to upload their question papers together with reference answers and student answer scripts which have been scanned. The system uses OCR to extract text from uploaded documents while NLP enables the processing of extracted text. The LLM performs answer assessment by analyzing student responses for their meaning and relevant content while RAG obtains related reference data to assist in the assessment process.

The system produces marks for each question and for each section together with complete marks and evaluation reports. React.js, Python, FastAPI, and PostgreSQL serve as suitable tools for creating this application. The proposed system helps reduce manual work, save time, and make answer script evaluation more efficient.

Literature Survey/Review

Researchers have discovered that Artificial Intelligence (AI) together with Natural Language Processing (NLP) and Machine Learning systems enable automated systems to evaluate student responses. The evaluation process through traditional methods needs faculty members to manually review every answer which requires them to spend significant time and perform extensive work.

Large Language Models (LLMs) have advanced AI systems through their ability to process human language and their text assessment capabilities. Large language models struggle to produce correct evaluation scores because they fail to understand the required answers and they lack sufficient knowledge about the subject matter.

The Retrieval-Augmented Generation (RAG) system solves this problem through its ability to fetch applicable information from reference materials which it uses to evaluate answers. The system supports evaluation through its ability to work with question papers and answer keys and all other materials which belong to the subject.

The literature review demonstrates that automated assessment systems receive support from various techniques which include keyword matching and text similarity and NLP and AI-based evaluation systems. The Automated Answer Script Evaluation System uses OCR technology together with NLP and LLMs and RAG to create a single platform which reduces human work and enhances the speed of answer script evaluation.

Methodology

The Automated Answer Script Evaluation System uses a method which combines multiple modules to assess student responses. Faculty members need to access their accounts before they can submit their question papers together with reference answers and student answer sheet images.

The second step involves extracting text from the uploaded documents using Optical Character Recognition (OCR). The system applies Natural Language Processing (NLP) methods to handle the extracted text which transforms it into an evaluation-ready state. The system identifies all questions and their corresponding student responses which it needs to evaluate.

The next stage requires students to have their answers assessed through Large Language Models which operate with Retrieval-Augmented Generation technology. The system retrieves relevant information from reference answers and subject materials to support the evaluation. The answers undergo analysis through their meaning and their relevance and their accuracy.

The system generates three types of marks through its calculation process which produces individual question scores and entire section scores and final total scores. The evaluation results get stored in the database system which creates organized reports for display. Faculty members have the ability to access results and they can obtain copies of the reports. The application operates through React.js frontend which connects to a Python backend that runs FastAPI and accesses its data through PostgreSQL database system.

CONTENT

The Automated Answer Script Evaluation System functions as a web-based application which helps teachers save time during their student answer script evaluation process. The system extracts text through OCR which then NLP processes the answers before LLMs with RAG technology evaluate the answers. The system enables faculty members to perform answer evaluation while they calculate marks and produce reports through an efficient process.

Table1:Overview of key features implemented in Automated answer script evaluation

Feature	**Description**	**Technology used**
Faculty Login	Allows authorized faculty members to access the system.	React.js, FastAPI
Document Upload	Uploads question papers, reference answers, and student answer scripts.	React.js, FastAPI
Text Extraction	Extracts text from scanned documents and answer scripts.	OCR, Python
Text Preprocessing	Processes extracted text for answer evaluation.	Python, NLP
Reference Answer Retrieval	Retrieves relevant reference information to support evaluation.	RAG, Vector Database
Answer Evaluation	Analyzes students' answers based on meaning and correctness.	LLM, RAG
Result Management	Stores and displays evaluation results.	PostgreSQL, FastAPI



Fig. 1: **Automated answer evaluation output.**

Research and Reviews:

The research studies from the past revealed that AI systems together with NLP and Machine Learning technologies function as automated systems which perform evaluation operations on student answer documents. The technological systems operate by reading text content which they use to locate vital data elements that help students receive proper answers.

Answer evaluation systems which exist today require humans to perform manual evaluation through keyword matching and text similarity techniques. The proposed Automated Answer Script Evaluation System operates as a single platform which uses OCR technology and NLP processing and LLMs with RAG systems to perform answer evaluation.

Results & Discussion

The analysis of the Automated Answer Script Evaluation System shows how AI technologies can support the examination evaluation process. The OCR module extracts text from scanned question papers and student answer scripts, reducing the need for manual text entry.

The AI-based evaluation module analyzes students' answers using their meaning and relevance. RAG retrieves relevant reference information to support the evaluation process. The system organizes the results into question-wise marks, section-wise marks, and total marks, allowing faculty members to review and download evaluation reports

However, the system has some limitations. The evaluation process depends on three main factors which include OCR accuracy and reference answer quality and AI model performance. Handwritten text that is unclear may also affect the results. The system provides a solution which decreases human work duties while increasing evaluation speed for student answer sheets.

Discussion

The Automated Answer Script Evaluation System shows how artificial intelligence systems operate during educational assessment tasks. Faculty members need to upload answer scripts because the system helps them evaluate answers through its automated support system.

The system operates with RAG which helps it find suitable reference information before it begins to check user responses. The AI model will deliver better context-based assessments because it moves past its original method which matched keywords exactly.

The system requires additional development through better OCR technology and superior reference materials and enhanced evaluation techniques. Faculty members need to check the generated marks before they confirm the final results because this process ensures both fairness and accurate assessment.

Conclusion

The Automated Answer Script Evaluation System using LLM and RAG is designed to make the examination evaluation process easier and faster. The system merges OCR technology with NLP and AI and RAG systems to perform answer extraction and answer processing and answer evaluation for students.

The system allows users to calculate marks for each question and produces complete marks and generates reports. The system reduces staff members from doing the same tasks repeatedly while providing them with a system which organizes their evaluation results. The suggested system establishes a fundamental structure which enables users to perform answer script evaluations with better speed and standardized processes.

Future Scope

The Automated Answer Script Evaluation System will expand its future capabilities by developing better handwriting recognition technology and expanding its support for multiple language options. The evaluation process of student answers will become more effective through the implementation of advanced AI models which will enhance their answer comprehension abilities.

The system requires additional development to achieve automatic student result tracking and it should generate detailed performance data which will produce graphical output. The application will become more useful through two additional features which allow users to evaluate large numbers of answer scripts and link the system with their college management software. Human verification will remain part of the process to boost the accuracy of final grades which students receive.

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