Research Project: Automated Marking System Using AI

Case Study: Multimedia University

Chapter One: Introduction

1.1 Chapter Introduction

Education has always relied heavily on assessments to measure student performance and understanding. However, traditional manual grading systems face significant challenges in terms of efficiency, scalability, and consistency. This chapter introduces the concept of an Automated Marking System (AMS) using Artificial Intelligence (AI), a technology that addresses these limitations by streamlining grading processes.

1.2 Motivation and Background

This has put immense pressure on educators to evaluate students quickly and correctly as more and more students attend universities like Multimedia University. Manual grading is slow and susceptible to human error, resulting in delayed responses and unjust marking systems. Supported by advances in deep learning algorithms, AI-based solutions are proving to be revolutionary technologies in industries as diverse as education, where they can perform routine tasks automatically, reducing subjectivity and increasing efficiency (Sharma & Dey, 2022).

For instance, AI-based tools such as Turnitin have already proved their effectiveness in text analysis and plagiarism detection. Developing such technologies into a complete AMS will pave the way to reducing the hassle faced by academics, create more equity, and offer full feedback to the students in the shortest time possible. Established at Multimedia University, it reflects on its enthusiasm for effectively using technology to ensure academic excellence.

1.3 Background of Research

These solutions employ AI technologies such as Machine Learning and Natural Language Processing to assess the work submitted by students. The first generation of such solutions focused on objective assessments, such as multiple-choice questions, using Optical Mark Recognition. Today, with the advances made in AI, it is possible for a system to grade subjective tasks such as essays, programming assignments, and creative projects on its own (Buchanan et al., 2021).

1.4 Problem Statement

Manual grading systems at Multimedia University face several challenges:

Time-Consuming: Marking hundreds of scripts delays feedback, affecting students' ability to improve.

Subjectivity: Human biases lead to inconsistencies in scoring, potentially undermining fairness.

Errors: The manual process increases the likelihood of mistakes in recording and evaluating marks.

Resource Strain: Faculty spend excessive time on grading, limiting their availability for teaching and research.

Without addressing these challenges, the institution risks falling behind in providing high-quality education.

1.5 Aim of Research

This study aims to develop and implement an AI-based Automated Marking System for ease of grading processes in Multimedia University efficiently, accurately, and with fairness in assessment.

1.6 Objectives of the Research

The following are the objectives of the study:

Analyze the manual grading processes currently in place to identify the inefficiencies.

Develop a prototype AMS that can handle both objective and subjective assessments.

Test and validate the system for its accuracy, reliability, and scalability.

Evaluate the impact of the system on educators' workload and students' satisfaction.

1.7 Justification of Research

Automation of grading processes is the surest way of overcoming the inefficiencies of manual and subjective methods. The AMS will provide consistent grading, reduce turnaround time, and provide detailed feedback for the enhancement of learning. To Multimedia University, this research represents a realization of a mission to incorporate technology in the teaching and evaluation processes. Additionally, the AMS can be used as a yardstick for other institutions in view of adopting similar solutions.

1.8 Scope of Research

The research focuses on developing and testing a prototype AMS for use within Multimedia University. The system will evaluate both objective (e.g., multiple-choice) and subjective (e.g., essays) assessments. The study will not cover assessments requiring physical demonstrations or creative outputs like art or design projects.

1.9 Research Organization

The research is organized as follows:

Chapter One: Introduction, motivation, background, and objectives.

Chapter Two: Literature review covering related work, emerging trends, and research gaps.

Chapter Three: Methodology for system design, development, testing, and deployment.

Chapter Four: Results and discussion.

Chapter Five: Conclusion and recommendations for future work.

1.10 Chapter Summary

This chapter has introduced the motivation, background, and scope of the research. It outlined the problem statement, research objectives, and the proposed approach to developing an AMS. The next chapter reviews related work to establish the study's foundation.

Chapter Two: Review of Related Work

2.1 Chapter Introduction

The review embraces literature related to automated grading systems, AI in education, and challenges of using such technologies. There is emphasis on global and local developments regarding AMS, highlighting the gaps that were addressed in this research.

2.2 History of the Research Topic

The concept of automated grading started with OMR systems in the 1960s, mainly for multiple-choice questions (Huang et al., 2019). This progressed into essay grading in the 2000s using advances in NLP, such as Intelligent Essay Assessor (IEA). Recent AI-driven systems use deep learning to evaluate a wide range of assessment types (Sharma & Dey, 2022).

2.3 Review of Related Prototypes and Systems

Global Perspective

Turnitin: While focused on plagiarism detection, it also offers limited grading functionality.

EdX Grader: It utilizes ML to grade programming assignments (Buchanan et al., 2021).

Local Perspective

Kenyan higher education only applies automated systems in plagiarism detection; thus, no robust AMS has been implemented at a national scale. Multimedia University is well positioned to take the lead in implementing such a system.

2.4 Emerging Trends and Patterns

Hybrid Systems: These take advantage of AI and add a layer of human oversight to ensure high accuracy.

Scalable Architectures: Cloud-based systems with support for large datasets.

Personalized Feedback: Providing granular details about students' performances through the use of AI (Baker, 2020).

2.5 Research Gap

Most of these current systems are not adaptable to diverse academic settings, such as those at Multimedia University. Many of them can either handle objective or subjective tasks but not both, hence the need for a more versatile, institution-specific AMS.

Conclusion

2.6 Chapter Summary

This chapter reviewed global and local developments on AMS, identified trends, and established gaps that exist in current research. The next chapter provides the methodology for developing and validating the proposed system.

Chapter Three: Research Methodology

3.1 Chapter Introduction

This chapter outlines the methodology to be used in requirements specification, system design, development, testing, and deployment.

3.2 Literature Review Methodology

A systematic review was performed in academic journals, conference proceedings, and industry reports to find the best practices and trends in the development of AMS.

3.3 Methodology for Requirement Specification and Data Collection

Interviews: Conducted with faculty for understanding challenges in grading.

Questionnaires: Forwarded to students in order to get feedback on existing methods of assessment.

3.4 Methodology for System Analysis

Existing System

The manual process of grading was modeled using:

Data Flow Diagrams (DFDs): To map information flow

Context Diagrams: For identifying the boundary of a system.

3.5 System Design Methodology

Proposed System

The architecture of AMS consists of:

Database Design: MySQL to store assessment data.

DFDs and Use Case Diagrams: For the interaction of the system.

Prototypes: Initial design of I/O.

3.6 System Implementation Methodology

Back-End: Python with TensorFlow and SpaCy for ML and NLP tasks.

Front-End: HTML/CSS and Flask for web interfaces.

Database: MySQL for secure data storage.

3.7 System Testing Methodology

Testing Plan: Unit and integration testing for different components.

Testing Techniques: Testing the accuracy, scalability, and user acceptance.

3.8 System Deployment Methodology

The system will be installed on a university server. Training for the faculty and IT staff will also be provided.

3.9 Chapter Summary

This chapter presented the methodologies of system design, development, and testing. The subsequent chapter will discuss the results of the system validation and its impact on grading processes.

References

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