Transforming Education with SmartPaper AI: A New Era of Efficiency and Insight

Web-based System

In a world where educators are challenged by growing class sizes and time constraints, the critical tasks of creating effective assignments and providing personalized feedback remain a struggle. SmartPaper AI isn't just another tool; it's a revolutionary solution designed to reclaim valuable teaching time and fundamentally improve student outcomes. Our platform leverages the power of advanced AI to instantly generate diverse academic papers, but its true value lies in its intelligent grading engine. SmartPaper AI provides a level of detailed, instant feedback that was once impossible, empowering teachers to focus on mentorship and students to learn from their mistakes immediately. By automating the tedious aspects of assessment, we empower schools and universities to achieve unprecedented efficiency and unlock new opportunities for learning.

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1. Introduction

1.1 Purpose

The purpose of this Software Requirements Specification (SRS) is to detail the requirements for an AI-powered, web-based application that generates and checks academic papers. The system, titled SmartPaper AI, will serve as a tool for teachers and students to streamline the assignment process, provide automated grading, and offer personalized feedback.

1.2 Scope

This document defines the features and functionalities that will be included in the initial version of SmartPaper AI.

In Scope:

- Generation of unique academic papers based on teacher-provided data (e.g., topics, difficulty level, subject matter).
- Automatic checking and grading of student submissions.
- Provision of detailed feedback on mistakes.
- Suggestion of relevant topics for revision based on student errors.
- User authentication and role management for teachers and students.

Out of Scope:

- Real-time student-teacher chat functionality.
- Plagiarism detection.
- Integration with third-party Learning Management Systems (LMS).

1.3 Target Audience and Stakeholders

- **Teachers:** Will use the system to generate paper assignments and automatically grade student submissions.
- **Students:** Will use the system to submit assignments and receive detailed feedback.
- **Administrators:** Will manage user accounts and system settings, including the central database of study materials.

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2. Overall Description

2.1 Product Perspective

SmartPaper AI will be a standalone, web-based application accessible via a standard web browser. It does not require any additional software installation to function. The system will operate independently to fulfill its core functions of paper generation and checking.

2.2 Product Functions

The primary functions of the system are:

- **Paper Generation:** Teachers can input specific criteria to generate unique paper assignments, using either their own uploaded materials or a central database of study materials provided by the administrator.
- **Paper Checking/Grading:** The system will automatically check and grade student-submitted papers.
- **Feedback and Suggestions:** The system will provide detailed feedback on errors and suggest topics for review.
- **User Management:** The system will have separate roles for teachers and students, with appropriate access controls.

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3. Specific Requirements

The following requirements are divided into logical groups to provide a clear understanding of the system's functionality and workflow.

3.1 User & Material Management

FR-006: User Authentication The system shall have a secure login for both teachers and students.

- **Procedure:**
    - A user (teacher or student) enters their unique username and password on the login page.
    - The system verifies the credentials against its user database.

- If the credentials are valid, the user is granted access to their specific dashboard based on their role.
- If the credentials are invalid, an error message is displayed.

3.2 Paper Creation & Management

FR-001: Paper Generation The system shall allow a teacher to generate a paper based on different criteria, question types, or by uploading their own custom paper.

- **Procedure:**
  - The teacher logs in and navigates to the "Create Paper" section.
  - They select a subject and a specific class.
  - The teacher can choose one of two options for paper creation:
    1. **Generate from Sources:** The teacher chooses source material (previously uploaded key books, past papers, or personal text) and a generation mode: "As Is" from Past Papers, "As Is" from Key Book, or "Intelligent" from Key Book. They then select question types and marks.
    2. **Upload Composed Paper:** The teacher uploads their own pre-composed paper. If the paper is a handwritten document, the system will use Optical Character Recognition (OCR) to extract the text. The system will then present an editable version of the paper and prompt the teacher to format the paper to align with the system's structure (e.g., identifying question boundaries, assigning marks, and specifying question types like MCQs, short answers, or long answers).
  - The system generates and displays the final paper for review, which the teacher can then print or assign for an online test.

3.3 Paper Submission

FR-002: Paper Submission The system shall provide both teacher-managed and student-initiated workflows for paper submission.

- **Procedure (Teacher-Managed Uploads):**
  - The teacher logs in and goes to the "Upload Submissions" section.
  - They select the specific class, subject, and the corresponding paper.
  - The teacher has the option to upload papers **individually** or in **bulk**.
  - If uploading in bulk, the teacher uploads all student papers at once. The system will display the uploaded files for the teacher to manually select and assign them to the correct students. For example, if a teacher uploads 16 files, they would select the 2 files belonging to Student A and assign them, then the 3 files for Student B, and so on.

- After the upload and assignment are complete, the system organizes these files.

- **Procedure (Student-Initiated Uploads):**
  - The system generates a unique upload link for a specific paper or assignment.
  - The teacher shares this link with students.
  - A student accesses the link, enters their unique roll number for verification, and is prompted to upload their completed paper files.
  - After selecting the files, the student submits their paper through the system.

3.4 Automated Grading & Feedback

FR-003: Automated Grading The system shall automatically grade student submissions based on the generated paper's criteria and the context from key books, using a method chosen by the teacher.

- **Procedure:**
  - The teacher logs in and selects the student submissions they want to grade.
  - They select the correct key book or source material for verification.
  - The teacher then chooses the assessment methodology for short and long-answer questions by selecting one of two options:
    - **Literal Comparison:** The system performs a direct, word-for-word comparison of the student's answer against the key. If the student's answer does not match the key precisely, it will be marked as incorrect and a score of zero will be assigned.
    - **Conceptual Matching:** The system analyzes the student's answer to determine if it is contextually and conceptually aligned with the key book or source material. If the answer is in the correct context, the system will assign marks appropriately.
  - The teacher clicks the "Begin Paper Assessment" button.
  - The system analyzes the student's answer sheet. For MCQs, it checks against a predefined answer key. For Short and Long Answer Questions, it applies the chosen assessment methodology.
  - The system then saves the scores for each paper in the student's database.

FR-004: Detailed Feedback The system shall provide a detailed breakdown of a student’s performance, including a full list of mistakes.

- **Procedure:**
  - Following the automated grading, the system generates a detailed feedback report.
  - The report includes the final score, individual question scores, and specific feedback on errors.

- The system identifies and highlights mistakes (e.g., logical errors, incorrect facts) within the student's answers.
- This feedback report is made available to both the teacher and the student.

FR-005: Revision Suggestions The system shall suggest specific topics for students to revise based on their mistakes.

- **Procedure:**
  - Based on the mistakes identified in the feedback process, the system cross-references the errors with the key books or source materials.
  - The system generates a list of specific topics or chapters for the student to review.
  - These revision suggestions are included in the feedback report.

3.5 Non-Functional Requirements

These requirements specify the quality attributes of the system.

- **Performance:** The system should be able to check a standard student paper (e.g., 1,500 words) and provide a grade within a few minutes.
- **Security:** The system must protect user data (e.g., papers, grades) and ensure secure authentication.
- **Reliability:** The system should have a high uptime and be available 24/7. In case of an error, it should log the issue and notify an administrator.
- **Usability:** The user interface (UI) should be intuitive and easy for both teachers and students to navigate.
- **Scalability:** The system should be designed to handle a growing number of users and papers without a significant drop in performance.
- **Technical Environment:** The system will be a web-based application, likely built with a modern web framework and a database to store user and paper information.

Supervisor: Eng. Muhammad Ramzan
eng.ramzanrazi@gmail.com
+923116867897