Personalised Learning System Using LLM

Mr. M. Logaprakash
Assistant Professor(SL.Gr)
Department of Artificial Intelligence and Data Science
Sri Ramakrishna Engineering College, Coimbatore -22.

N. Manjunath
Student
Department of Artificial Intelligence and Data Science
Sri Ramakrishna Engineering College, Coimbatore -22.

K. Rubanraaj
Student
Department of Artificial Intelligence and Data Science
Sri Ramakrishna Engineering College, Coimbatore -22

V. Srinivas
Student
Department of Artificial Intelligence and Data Science
Sri Ramakrishna Engineering College, Coimbatore -22.

Abstract— The "Personalized Learning System" introduces a groundbreaking approach to education, merging advanced LLM techniques with interactive web technology to enrich the learning journey for students. By enabling users to input textbooks and syllabus details, the system generates customized summaries, quizzes, and answer keys tailored to individual learning requirements. Utilizing cutting-edge LLM models and implemented through the Streamlit framework, it delivers intuitive interfaces for seamless interaction.

Through real-time feedback mechanisms and adaptive learning pathways, the "Personalized Learning System" empowers students to interact with educational materials dynamically, promoting deeper understanding and retention. This innovative project signifies a significant shift in traditional teaching paradigms, heralding a new era of personalized and effective learning experiences globally. By leveraging technology to cater to individual learning styles, it holds the potential to revolutionize educational practices and provide students with tailored support for optimal academic achievement.

Keywords—— LLM,Streamlit,Summary generation,Quizzes,AnswerKey Generation

I. Introduction

The "Personalized Learning System" disrupts traditional exam preparation methodologies by acknowledging the limitations of one-size-fits-all educational approaches. This pioneering project is engineered to empower students through a fusion of advanced natural language processing and dynamic content generation. By allowing users to input multiple textbooks and specify their subject syllabus, the system generates personalized explanations tailored to the provided materials

Driven by insightful and contextually relevant answers derived from NLP, students can pose queries directly related to the syllabus, fostering deeper understanding and engagement. Additionally, the system offers an interactive quiz feature for self-assessment, enabling learners to evaluate their grasp of the subject matter in real-time.

Innovatively, the platform extends its utility by accepting previous year question papers, furnishing students with precise answer keys. This multifaceted approach aims to optimize exam preparation strategies and promote individualized academic success, ultimately redefining the educational landscape by catering to the diverse learning needs of students.

II. OBJECTIVE

The primary objective of the Personalised Learning System is to enhance adaptability in exam preparation by catering to the diverse needs of individual students. This involves providing personalized learning experiences tailored to each student's learning style, pace, and comprehension level. PLS aims to seamlessly integrate multiple textbooks and learning resources into a single platform. integration allows for dynamic content adaptation, ensuring that students have access to the most relevant and up-to-date information aligned with their syllabus. Another objective is to generate tailored explanations for various concepts and topics covered in the syllabus. Leveraging advanced Large Language Model (LLM), the Personalised Learning System can provide explanations that are personalized to each student's level of understanding and learning.

III. WORKING PRINCIPLE

The Personalised Learning System (PLS) operates on the principle of adaptability and personalization to meet the diverse needs of individual students. It achieves this by tailoring learning experiences according to each student's unique learning style, pace, and comprehension level. At its core, the PLS seamlessly integrates multiple textbooks and learning resources into a unified platform. This integration facilitates dynamic content adaptation, ensuring that students have access

to the most pertinent and current information aligned with their syllabus requirements.

One of the key functions of the PLS is to generate customized explanations for various concepts and topics covered in the syllabus. Leveraging advanced Large Language Models (LLMs), the system analyzes inputted textbooks and syllabus information to provide explanations personalized to each student's level of understanding and learning preferences. Through this working principle, the PLS aims to foster a more engaging and effective learning environment by empowering students with personalized support and resources tailored to their individual learning needs. By adapting to each student's requirements, the system strives to enhance comprehension, retention, and overall academic performance.

IV. SYSTEM DESIGN

A multi-module architecture is integrated into the system design to effective responses. The Pdf Question Answering Module extracts information from PDF documents and also provides detailed explanations and contextualized answers to user queries. By harnessing the Falcon module, it employs state-of-the-art natural language understanding techniques to interpret complex questions and retrieve relevant information from educational materials. This module enhances learning by offering comprehensive insights and fostering deeper understanding. The Summary Generation Module offers customization options, where user can provide the syllabus and generate summarization for the topics in the syllabus automatically. Leveraging the Falcon module, it dynamically adjusts the summarization process based on user preferences, ensuring that summarized content aligns with their specific needs and study goals. This module promotes efficient knowledge acquisition by delivering tailored summaries tailored to individual learning objectives.

Then, The Quiz Generation module features adaptive difficulty levels and personalized question pools, catering to users with varying proficiency levels and learning styles. Using the Gemini model, it dynamically adjusts the quiz content based on user performance, ensuring an optimal balance between challenge and comprehension. This module fosters continuous improvement and mastery learning by providing targeted assessments that evolve with users' knowledge. In addition to generating answer keys, the Answer Key Generation module offers insights into common misconceptions and pitfalls encountered in quiz questions. Leveraging the Gemini model's analytical capabilities, it identifies areas of difficulty and provides detailed explanations for correct answers, empowering users to address knowledge gaps and enhance their understanding. This module promotes self-directed learning and facilitates targeted remediation efforts. The User Interface (UI) module, developed using the Streamlit framework, serves as the primary interaction point for users to access the functionality of the entire system Through Streamlit, the UI seamlessly integrates with the backend modules responsible for PDF question answering, summary generation, quiz generation, and answer key generation.
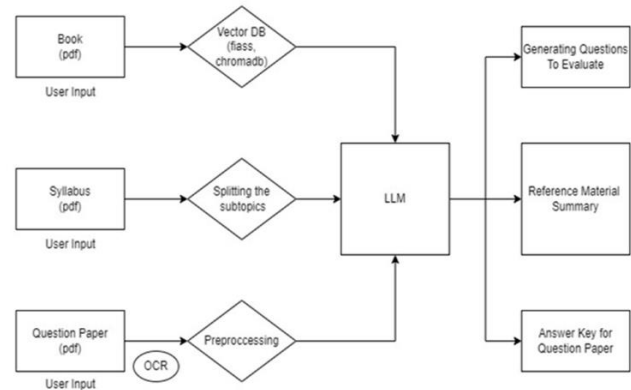

Figure 1. Block Diagram

A. Existing system

Prior to the current system, paper evaluation of language models in question-answering tasks, facilitated by a dataset encompassing trial information and diverse inquiries and different question formats, has provided a nuanced perspective on their performance on information retrieval-based QA task [1].

In addition, Question Answering System Using NLP is also made which answers the question asked[9]. There are all question generating system which is evaluated LLM capabilities for generating isomorphic MCQs from pre-existing question banks [7]. Our findings may present a valuable resource for instructor seeking to enhance their course materials and solve an existing problem of recycling question banks.

B. Proposed work

The proposed work aims to provide a holistic learning experience by combining advanced large language models, adaptive learning mechanisms, and user-friendly interfaces to support efficient knowledge acquisition and mastery learning. PDF Question Answering module extracts information from PDF documents and provides detailed explanations and contextualized answers to user queries. It utilizes falcon model to interpret complex questions and retrieve relevant information from educational materials. Summary Generation Module allows users to provide syllabus information and automatically generates summaries for topics within the syllabus.

Quiz Generation Module caters to users with varying proficiency levels and learning styles. It dynamically generates quiz content based on user performance, providing targeted assessments that evolve with users' knowledge. In addition to generating answer keys, the Answer Key Generation module generates answer key for the question paper using Gemini pro model.

Developed using the Streamlit framework, The UI module serves as the primary interaction point for users to access the system's functionality. It seamlessly integrates with backend modules responsible for PDF question answering, summary generation, quiz generation, and answer key generation.

RESULT

The "Personalized Learning System" project was evaluated using a diverse dataset of educational documents, including textbooks and syllabus materials. The system successfully processed and analyzed these documents, extracting key information and generating personalized summaries, quizzes, and answer keys tailored to user specifications.

In Figure 2, the dataset document used for testing is displayed, showcasing its complexity and variety of content. This document served as the basis for evaluating the system's ability to accurately extract information and provide relevant responses.

In Figure 3, a sample response from the system for a user query is presented. The system effectively interpreted the query, generated a concise summary of the relevant content from the dataset document, and provided accurate answers to the user's questions. This demonstrates the system's proficiency in understanding user queries and delivering contextually relevant responses.

Overall, the results demonstrate the efficacy and potential of the "Personalized Learning System" in enhancing the learning experience by providing tailored and informative content based on user needs and preferences.
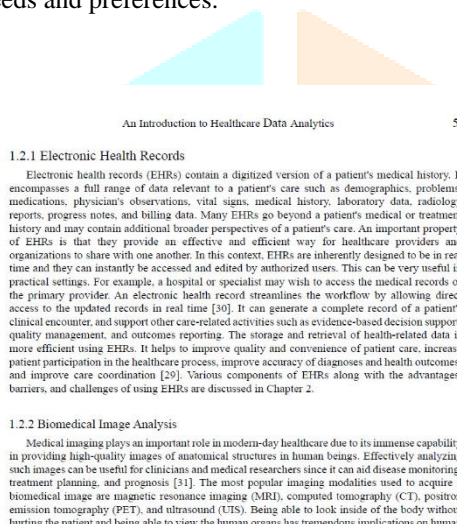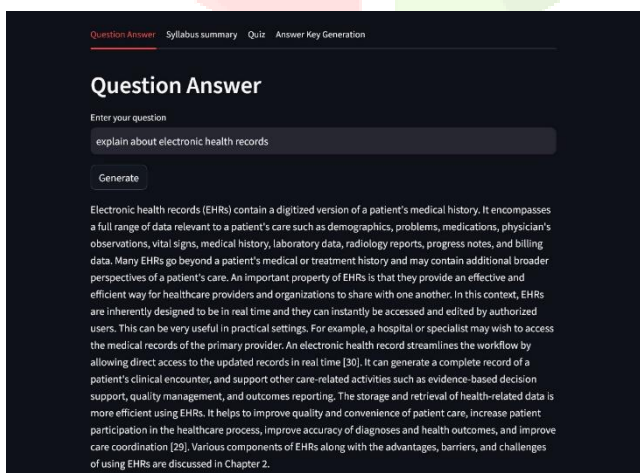

Figure 2. Dataset document

Figure 3. Response from the system

CONCLUSION

In conclusion, the "Personalized Learning System" project represents a significant advancement in educational technology, offering tailored and interactive learning experiences for students. Through the integration of Large Language Model and the Streamlit framework, the system has demonstrated its capability to generate personalized summaries, quizzes, and answer keys, enhancing comprehension and engagement. While challenges such as occasional inaccuracies in LLM-generated content and scalability issues were encountered, ongoing optimization efforts have shown promising results in addressing these limitations. Moving forward, the project holds immense potential for future development and enhancement.

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