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AI Driven - Online Quiz Assessment System

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Abstract: ***This paper presents an innovative application of artificial intelligence (AI) to develop a smart quiz application for generating questions related to any topic based on user preferences. Conventional quizzes operate within the constraints of pre-defined question banks that may become irrelevant with time and offer limited options for customization. However, the proposed application leverages Open Router API, serving as a gateway to language models, to develop a dynamic question generator. The process entails user entry of a topic, after which the backend software communicates with the Open Router API for obtaining contextually relevant and timely questions. The system comprises a frontend framework of ReactJS and backend technologies including Node.JS and Open Router for integrating AI functionality. This approach becomes critical in adaptive learning technology and demonstrates how effective generative AI can be in educational software today. This paper presents a system that includes an intelligent quiz application powered by AI, capable of generating questions according to a topic provided by the user Classic quiz systems operate using pre-defined pools of questions that are outdated, limit user choices, and become repetitive after a while. However, this particular application leverages the Open Router API, which serves as an entry point to the language model, to establish an adaptable and scalable system of generating questions. The user inputs a desired topic, and the system interacts with the Open Router API to provide new questions. As the system architecture, ReactJS, and Node.js are used, supplemented by the Open Router API. The outcome of this work is highly accurate and educational AI-generated content. This approach becomes critical in adaptive learning technology and demonstrates how effective generative AI can be in educational software today.***

Keywords: Artificial Intelligence, Generative AI, Smart Quiz Application, Adaptive Learning, Question Generation, Open Router API, ReactJS, , Educational Technology, Intelligent Learning Systems.

I. INTRODUCTION

The fieldof digital education continues to evolve very rapidly, introducing many innovations, including those involving artificial intelligence (AI).

Although conventional quiz systems have demonstrated their efficacy in strengthening learning, they mainly operate through static databases that are not automatically generated but need regular human intervention. In addition to requiring regular updating and lacking flexibility, such solutions fail to take into account the current situation of the person using them, resulting in low engagement rates and decreased effectiveness. This paper aims to propose an innovative solution through the development of an AI-based system that dynamically generates personalized quizzes for the learners. To implement this idea, I plan to use the Open Router, an advanced API gateway that allows access to powerful AI models to generate diversified and contextually relevant questions on any chosen topic. This will make the process of preparing quiz questions easier and much more efficient. In particular, it will be possible to automatically generate various types of questions based on a specific topic or subject matter. To perform the mentioned task, AI models will be used that can understand educational information and create quizzes accordingly.

II. PROBLEM STATEMENT

The primary objective of the present research project is the development of an AI-powered interactive quiz generator application that will use the natural language processing techniques combined with generative AI to provide users with a personalized pool of dynamic quiz questions based on selected subjects. With its help, we aim to revolutionize the traditional approaches of static question banks used in the current assessment system with intelligent content generation technology and make learning process more interactive, versatile , and relevant for each individual. In recent years, due to the rapid development of the educational industry, the number of digital learning platforms has significantly increased, which makes it crucial to develop efficient online assessment tools.

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Currently, most existing online quiz applications only use static question sets, manual quiz creation, and rule-based assessment mechanisms. In contrast, such traditional assessment systems cannot provide students with personalized content, prompt feedback, and fail to evaluate the learners' higher cognitive skills, particularly when it comes to subjective and descriptive answers. As a result, students receive insufficient information about their progress, and teachers spend additional time on quizzes' creation, evaluation, and result interpretation. Moreover,

traditional online quiz generators are not adaptive to the individual student's capabilities since all learners have to complete quizzes at one difficulty level.

Moreover, maintaining the integrity of examinations is still an issue since there are no intelligent means of monitoring and detecting cheaters. Manually supervised exams are expensive, inefficient, and unscalable.

III. OBJECTIVES

To dynamically create quiz questions Automatically generate questions without relying on static pools of pre-existing questions through artificial intelligence .

To provide personalization in learning Give users freedom to select topic preferences, difficulty level, or subject so that the quiz aligns with their needs.

To avoid repetitive and outdated questions Make sure each quiz consists of unique and updated questions created in real time.

To increase user interaction Increase the level of engagement, interest, and decrease boredom compared to conventional quizzes.

To assess students' progress in real time.

Provide instantaneous results and feedback based on user responses to improve understanding.

To guarantee scalability and flexibility.

Develop a system that accommodates numerous users and generates infinite questions on various subjects.

To increase the educational value of AI applications

Use highly sophisticated language models to formulate correct, meaningful, and excellent questions.

To facilitate adaptive learning systems.

Facilitate learner improvement by providing suitable content according to their proficiency.

IV. LITERATURE REVIEW

The advancements in AI technology, natural language processing techniques (NLP), and modern web technology have significantly impacted digital learning systems, particularly with regard to the process of quiz development and7 assessment. It has been observed that there has been significant development in quizzes due to which the traditional quizzes have turned into intelligent AI-assisted platforms.

According to recent literature, it has been revealed that the transformer models including BERT and their customized forms have been very efficient in generating multiple choice questions through input sequences, context paragraphs, and answer phrases. This is because these models consider relationships within the text, extract crucial educational concepts, and develop high-quality questions along with distractors.

The integration of contextual data and sequential data improves the efficiency and relevance of generated multiplechoice questions. The conventional approach of AI-driven quizzes usually involves content ingestion where the instructors submit the required content in form of PDF files. The process involves ensuring educational validity based on predefined content requirements. Instructors can develop the questions with just one click, review them, edit them, and finally approve the quizzes assigned by them.

V. PROPOSED SYSTEM

In this phase, the purpose and scope of the AI based online quiz assessment system are determined. The requirements of users, functionalities of the system, and the non-functional aspects of the system are examined to get a grasp on expectations from the system. The importance of planning is that it leads to defining objectives clearly and minimizing risks of development.

System architecture, database design, and system modules are designed in this stage. Technology to be used in development, AI algorithm to be employed, and security techniques are decided in this planning phase. Development plan is prepared based on dividing the whole system into frontend, backend, AI, and database modules. A timeline for each module is established. Tests will be conducted to make sure that the system functions properly and safely. Deployment and maintenance plans are created in preparation for the release.

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AI-Based Question Generation: LLMs can be used to automatically create diverse, relevant questions (MCQs, fill in the blanks) from the provided material or topic. Adaptive Assessments: Machine learning algorithms can be used to monitor students' performance and adjust question complexity on the go to meet their needs and fill in any gaps in their knowledge. Automated Scoring and Feedback: Apply AI tools to score student responses promptly and provide immediately and personalized feedback to help students work on their weaknesses. Personalized Learning Paths & Analytics: Create in-depth performance analytics and dashboards for both students and educators, pointing out weak spots and enabling individual study plans. Security and Fairness: AI analytics should be implemented to control candidates' behavior during the test (response time, IP addresses), ensuring the security of exams and addressing any possible biases in AI--based question generation.

VI. SYSTEM ARCHITECTURE & METHODOLOGY

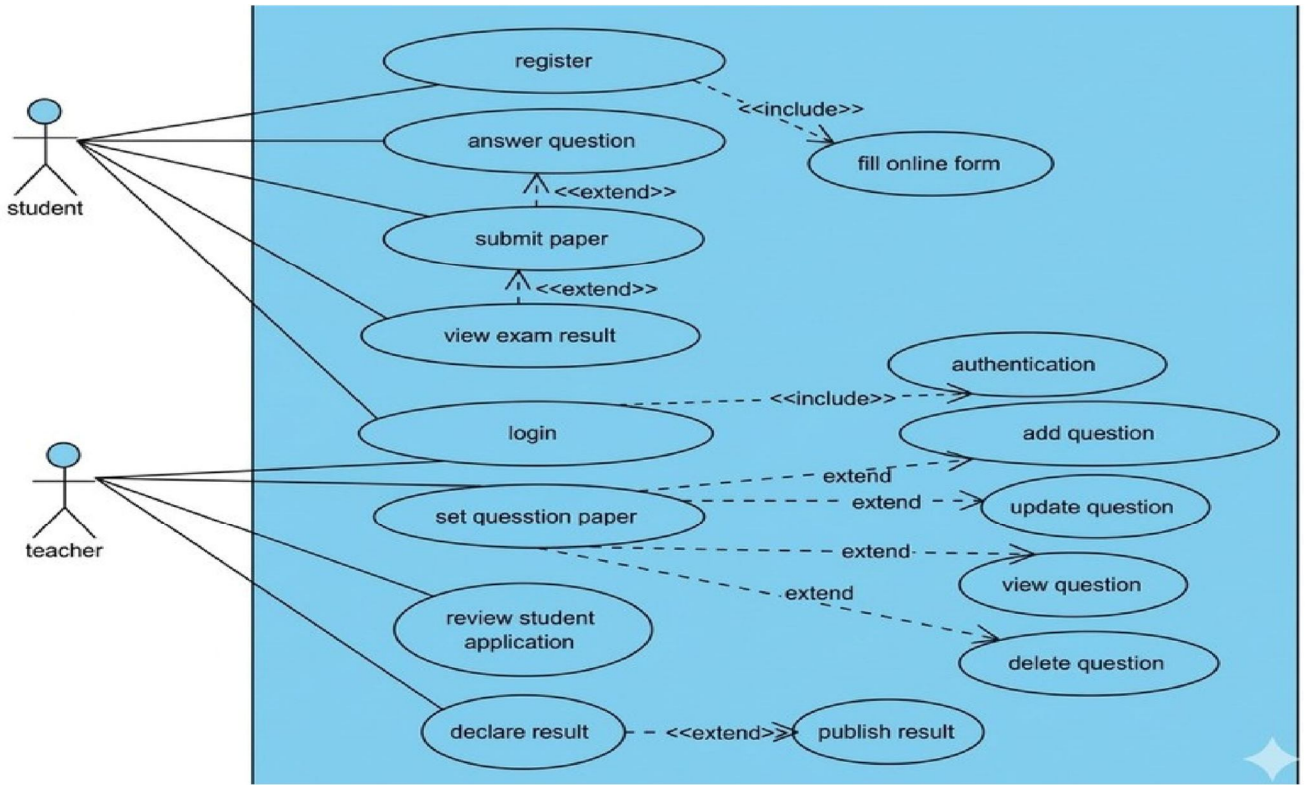
Domain Knowledge and Quiz Modelling. i QS leverages two fundamental mechanisms – namely, Domain Knowledge (DK), and a novel Quiz Ontology (QO). Precise domain knowledge represented by rich semantics is required when utilizing AI in different areas ([1] , [20]).

As far as our study is concerned, we were able to employ over three domain experts (tutors) who analyzed at least four courses, in addition to supplementary books related to those courses. Then, they built manually four ontologies defining knowledge concepts in detail and linking them to learning resources in different media formats such as text, audio, videos, presentations, and pictures.

1) The domain knowledge described above forms the foundation of our research as we are capable of tracking and identifying any knowledge gaps in terms of what a particular student knows.
2) It makes possible provision of targeted recommendations.
3) The second important point is our Quiz Ontology where we were innovative enough. Our innovations included: Each quiz contains two components, namely, a question itself and some options to be offered to the student. It allows building customized quiz questions flexibly.

VII. DIAGRAM

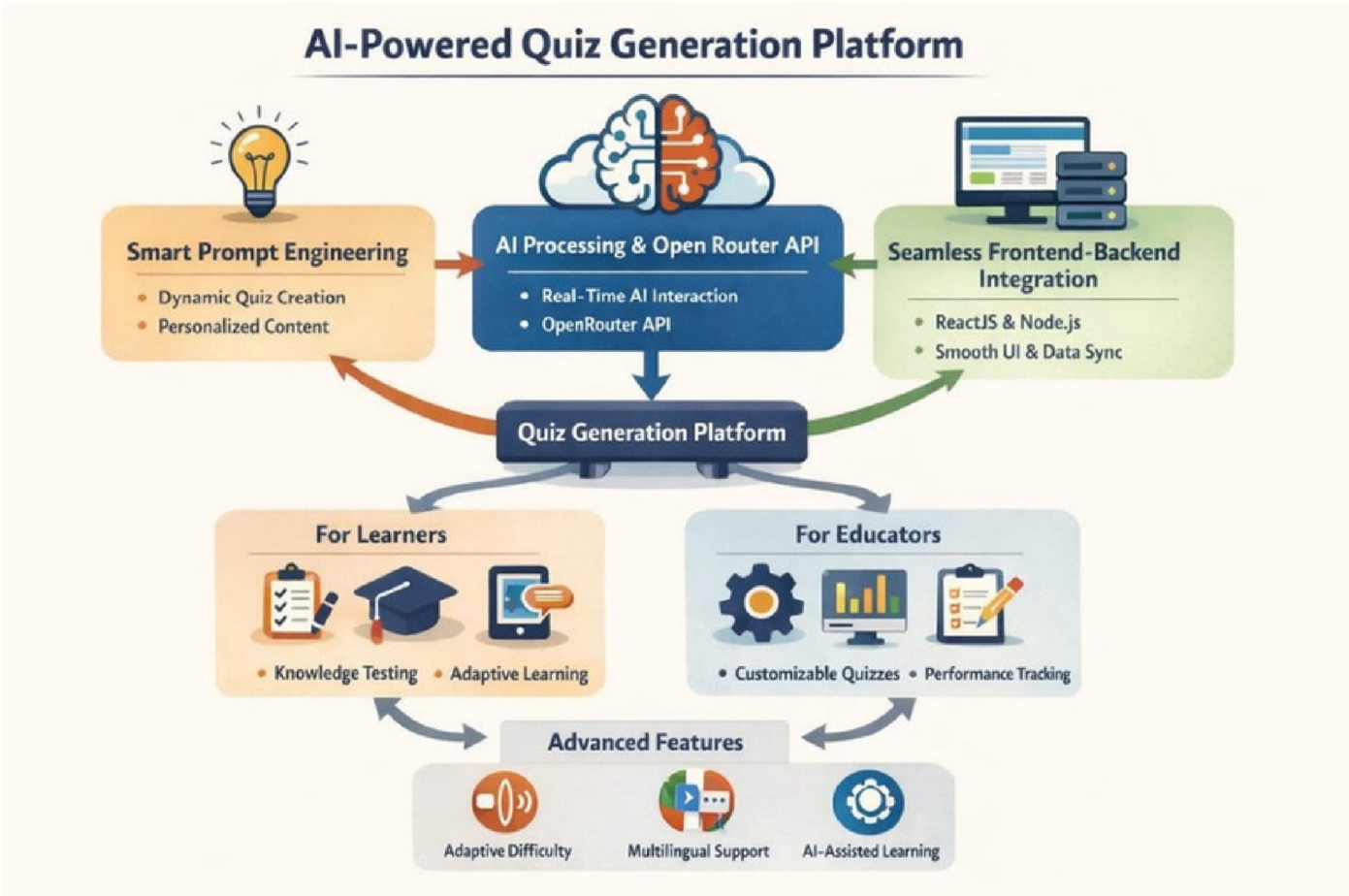
A. Use Case Diagram



B. Radial Diagram



C. System Architecture Diagram



VIII. IMPLEMENTATION AND RESULTS

Domain Knowledge and Quiz Modelling. iQS relies on two major mechanisms: Domain Knowledge (DK) and a novel Quiz Ontology (QO). It has been proven that well-structured and semantically rich domain knowledge is vital for any use of AI technology in various application domains ([1], [20]). As regards our study, there were more than three tutors working as domain experts, who investigated at least four courses and their corresponding books in terms of content analysis. These tutors designed ontologies for each course, specifying important knowledge concepts and associating them with particular types of learning materials (text, audio, videos, presentations, images). Our domain knowledge is the basis of the work carried out, which helps us trace students' knowledge gaps and estimate their level of knowledge acquisition (what a student knows and understands), thus offering relevant advice to students. Another critical part of our model is the Quiz Ontology. The innovative idea we have is described below:

A quiz question consists of two components – a statement and choices associated with the question.

One option may apply to several questions, while several questions may have one option in common.

Questions and options are stored in distinct databases.

1) A quiz question remains a theoretical concept till a collection of options appears right at that moment. Each option must have some connection to one or more knowledge items and corresponding learning materials.

2) It is only when all options are determined that one could see which specific knowledge is being tested by the question.

3) A quiz is a collection of quiz questions and appears right there and then when required for particular students.

4) After answering the quiz questions, the system calculates the outcome and shows an analysis page. The latter provides users with the total number of right and wrong answers and explanations of why some answers were wrong. In addition to showing the result in general, this section will feature an overall score or mark obtained by the person taking the quiz. Furthermore, users can check their previous results and get feedback on their progress.

IX. CONCLUSION AND FUTURE WORK

The creation of the AI-driven quiz creation platform represents a groundbreaking advancement in the field of modern education and personalized learning environments. With the use of intelligent prompt engineering, interactive AI engagement, and seamless backend and frontend communication, the platform revolutionizes the process of generating quizzes , delivering them, and interacting with the quizzes . Utilizing modern programming languages such as ReactJS and Node.js and APIs, including the Open Router API, the platform enables the generation of dynamic content, personalization according to user preference, and a captivating user interface design. It offers users an efficient mechanism for testing their skills while empowering instructors with effective means for modifying the generated content and monitoring learners' performance. As the platform develops, it paves the way for more sophisticated functionalities such as adaptive quizzes with varying difficulty levels, voice-based question answering, and multilingual quizzes.

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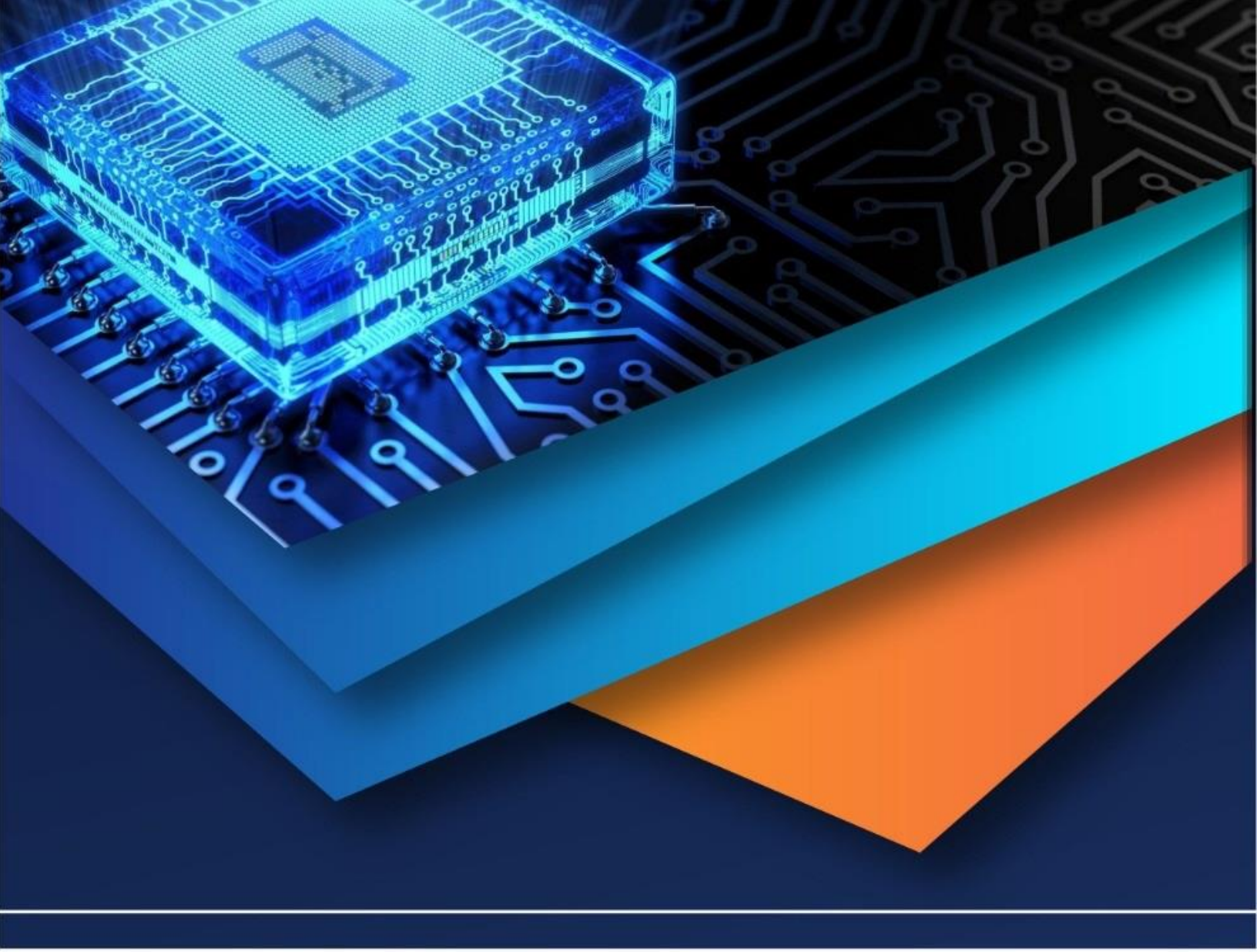
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