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Review on AI- Driven Online Quiz Assessment System

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Abstract: ***This system introduces a smart quiz application that uses AI to create questions based on topics chosen by users. Traditional quiz systems depend on fixed question banks, which often lead to outdated content, limited choices, and repetitive assessments. In contrast, this application uses the Open Router API, a doorway to language models, to build a flexible and scalable way to generate questions. Users can input a topic of interest, and the backend system interacts with the Open Router API to get fresh, relevant, and context-sensitive questions. The system architecture combines ReactJS for the frontend and Node.js for the backend, along with Open Router for AI integration. This improves user engagement and provides real-time, personalized learning experiences. The results show high accuracy, relevance, and educational value in the AI-generated content. This method plays a significant role in adaptive learning technologies and highlights the potential of generative AI in modern educational tools.***

Keywords: Quiz Application, Artificial Intelligence, Generative Model, Open Router API, ReactJS, Node.js, Dynamic Assessment, E-Learning

I. INTRODUCTION

In the fast-changing digital education landscape, artificial intelligence (AI) is changing how learners engage with content, especially in assessment and personalized learning. Traditional quiz systems have been effective for reinforcing knowledge, but they mainly use fixed question banks. These systems often need manual updates, don't adapt well, and don't match the learner's current situation or progress. As a result, user engagement can drop over time, and the quality of the learning experience declines. This project presents a new solution: an AI-powered dynamic quiz application that uses real-time generative models to automatically create quiz questions based on each learner's chosen topic. Instead of depending on standard, pre-written datasets, the system uses Open Router, a robust API gateway that connects to advanced AI models, to generate relevant and varied questions on demand. This greatly lowers the need for manual content creation while improving variety, relevance, and user engagement. The real-time generation of quiz content comes from Open Router's connection with large language models that can understand and synthesize educational material. Users can select a subject or topic, and the system quickly generates questions that are accurate, relevant, and suitable for teaching. In recent years, the education sector has seen a major shift towards digital and remote learning environments. As students increasingly use online platforms, the need for adaptable, interactive, and effective assessment tools has become clearer. Traditional quiz applications, while helpful, often have limited capabilities because they depend on manually created question banks. These fixed systems not only lack personalization but also become repetitive with time, leading to less interest and engagement from learners. This creates a need for smarter, more dynamic tools that can grow with the learner's progress. What makes this system unique is its ability to keep adapting to the learner's needs without relying on fixed content or manual input. The platform turns traditional quizzes into an interactive and intelligent learning experience, improving engagement, retention, and access across different knowledge areas. The main goal of this project is to build a real-time, AI-generated quiz platform that updates the assessment process, making learning more adaptive, scalable, and personalized. By using Open Router for dynamic content creation, ReactJS for an engaging user interface, and Node.js for backend operations, this system shows the strong potential of conversational and generative AI in changing education.

II. OBJECTTIVES

The main goal of this project is to create a real-time quiz application powered by AI. This app will generate personalized and dynamic quiz questions based on topics chosen by users, using natural language processing and generative AI. The system aims to replace traditional question banks with smart content generation that meets individual learning needs.

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This will ensure better engagement, variety, and relevance. By incorporating the latest AI technologies through Open Router and a modern web development setup, the project intends to provide an interactive, scalable, and personalized assessment experience that reflects human-like adaptability in educational settings.

A. *Main Points and Importance of Our Research*

1) AI-driven dynamic quiz generation: We developed a smart quiz app that uses Open Router to connect with generative AI models. This allows the real-time creation of personalized quiz questions based on topics chosen by users, removing the need for static question banks.
2) Scalable and efficient backend architecture: We built a strong backend using Node.js to manage quiz sessions, handle API requests, and ensure smooth communication between the user interface and AI services. This guarantees fast and reliable performance on different devices.
3) Real-time content personalization: The system generates a variety of relevant questions tailored to each user's chosen subject, difficulty level, and learning style. This improves engagement and boosts the educational value of each session.
4) Seamless integration of modern technologies: We combined ReactJS for a responsive and user-friendly frontend with generative AI for backend content creation. This delivers a smooth and modern user experience across web platforms.
5) Enhanced learning through continuous variability: By using generative models, the application presents learners with new and unique questions all the time. This reduces content repetition and encourages a deeper understanding through dynamic reinforcement.
6) Promoting intelligent education systems: We showed the potential of generative AI in education by creating a flexible, scalable, and smart quiz platform that can meet various academic fields and individual learning goals. In a real-world application, we highlighted the potential of artificial intelligence in digital learning by developing a scalable and easy-to-use quiz system that combines generative AI with smart automation to offer personalized, dynamic assessment experiences.

III. LITERATURE REVIEW

The progress in artificial intelligence (AI), natural language processing (NLP), and modern web technologies has greatly changed digital learning systems, especially in quiz creation and automated assessment. Research shows that traditional quizzes have evolved into smart, AI-driven platforms that improve efficiency, personalization, and educational integrity.

A. *AI-Driven Question Generation and Evaluation*

Recent studies reveal that transformer-based models, like BERT and its tuned versions, are very effective at generating multiple-choice questions (MCQs) from input sequences, context paragraphs, and answer phrases. These models look at relationships in the text, pull key educational concepts, and create coherent questions with believable distractors. Including contextual and sequential data further enhances the quality, relevance, and clarity of the MCQs generated. In AI-powered quiz systems, the process typically starts with content ingestion, where instructors upload materials such as PDF documents. These systems ensure educational validity using predefined content requirements. Educators can generate questions with one click, then review, edit, or approve them before assigning quizzes, combining automation with human oversight to maintain academic standards.

B. *PDF Processing and Content Validation*

Reliable document processing is a key part of AI-based quiz generation. Research emphasizes the need for multi-layered validation to ensure that quiz questions come from accurate and relevant academic content.

The first validation layer uses keyword filtering to scan uploaded documents for specific terms relevant to the subject matter. Documents that pass this step move into AI-based semantic validation, where transformer models check for academic integrity, coherence, and concept alignment. This two-step process greatly reduces the risk of generating misleading or irrelevant questions, improving the system's reliability and educational value.

C. *AI-Based Quiz Generation*

Once content is validated, AI-driven modules pull out important topics, concepts, and relationships using NLP techniques. The system then creates high-quality MCQs, each with one correct answer and three distractors. This ensures a logical structure, consistency with learning goals, and accurate assessment of student understanding. The automated yet academically sound question-generation process boosts efficiency for educators while preserving educational value.

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D. Existing Quiz Applications

Research on digital quiz applications shows their increasing use in educational settings due to better accessibility, engagement, and flexibility (Smith et al., 2019). However, many traditional quiz platforms still face issues with manual question creation, limited customization, and poor management systems (Jones & Brown, 2020). These challenges highlight the need for smarter, automated solutions that lessen teachers' workloads and enhance assessment quality.

E. AI in Education

The integration of AI in educational systems has grown significantly. Studies demonstrate that AI-driven tools improve personalized learning, automate administrative tasks, and boost overall learning outcomes (Williams & Johnson, 2021). AI algorithms analyze student performance, recognize patterns, and suggest tailored learning resources (Martin & Smith, 2022). Moreover, AI-enabled content creation and adaptive assessment systems enable more dynamic and student-focused instruction (Clark & Lee, 2020).

F. AI-Powered Quiz Applications

The rise of AI-powered quiz platforms represents a major shift in assessment methods. Wang et al. (2020) showed an NLP-based quiz system capable of automatically generating and evaluating student responses with better accuracy and efficiency. Similarly, Patel and Kumar (2021) highlighted the advantages of using AI for quiz customization, automated grading, and instant feedback, which promotes interactive and adaptable learning environments.

These systems are seen to increase student engagement, lighten instructor workloads, and provide real-time insights into learning progress.

G. Technological Frameworks Supporting Development

Modern web technologies like React.js, Strapi, Tailwind CSS, and TypeScript have significantly contributed to creating scalable, user-friendly, and solid educational applications. React.js enables modular, dynamic interfaces, Tailwind CSS supports clean and maintainable styling, and TypeScript enhances code quality with type safety (Roberts & Smith, 2021; Davis & Anderson, 2023). In the meantime, Strapi offers a flexible backend solution for effectively managing content, user data, and system logic (Taylor & Martin, 2022).

These tools together allow for the development of responsive, efficient, and feature-rich AI-powered quiz systems suited for today's educational environments.

IV. METHODOLOGY

Domain Knowledge and Quiz Modelling. iQS builds on two main mechanisms: Domain Knowledge (DK) and an innovative Quiz Ontology (QO). Well-defined domain knowledge with rich semantics is crucial for applying AI in various areas ([1], [20]). In our research, we had over three tutors as domain experts who explored at least four courses along with their supplementary textbooks, and manually created four ontologies. They defined key knowledge concepts in detail and linked them to specific learning materials in different formats (text, audio, videos, slides, and images). This domain knowledge forms the basis of our work, enabling us to track and pinpoint students' knowledge gaps and calculate their mastery of knowledge (what a student has learned and how well they understand it, see Fig. 3). This allows us to provide smart recommendations tailored to a student's current learning. The second key aspect is our Quiz Ontology, where our innovation lies. We summarized the following innovations: (1) a quiz question has two parts, the question itself and a set of options. This separation allows for the dynamic creation of personalized questions in a flexible manner. One option can relate to multiple questions and vice versa. Questions and options are stored in separate data pools. (2) A quiz question stays abstract until a set of specific options is created on the fly. (3) Every option must connect to one or more knowledge concepts and learning materials—only when all options are specified, does a question clarify what exact knowledge it tests. (4) A quiz consists of a set of quiz questions and can be created on the fly for individual students.

V. RESULT

After the user completes the quiz, the system processes their answers and displays a detailed result page. This page shows the total number of correct and incorrect responses and offers explanations for any wrong answers. The results section also includes a score or grade based on the user's performance. Moreover, users can review their past performance, compare results over time, and receive personalized feedback or suggestions for improvement. The system may also point out areas needing further study, contributing to an ongoing learning experience.

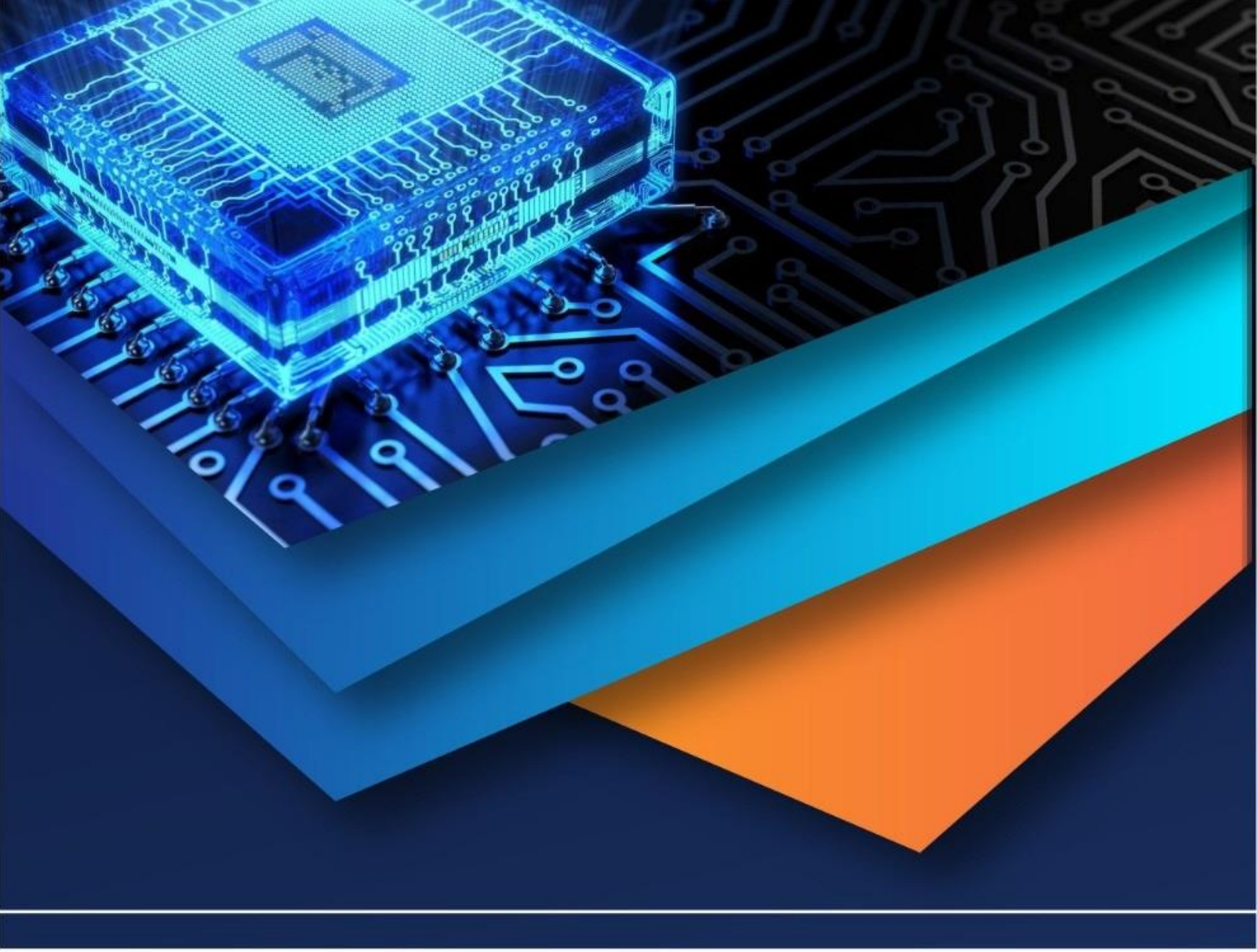
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VI. CONCLUSIONS

The development of the AI-powered quiz generation platform marks a significant step in modern education and personalized learning experiences. By integrating smart prompt engineering, real-time AI interaction, and smooth frontend-backend communication, the system changes how quizzes are created, delivered, and experienced. Using technologies like ReactJS, Node.js, and the Open Router API, the platform ensures dynamic content generation, adapts to user preferences, and offers an engaging user interface. It provides an easy way for learners to test their knowledge and gives educators powerful tools for content customization and performance tracking. As the system grows, it sets the stage for advanced features like adaptive difficulty levels, voice-enabled question answering, and support for multiple languages—leading to the next generation of AI-assisted educational platforms that are inclusive, scalable, and highly personalized.

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