Smart Learning With AI: Personalized Quizzes & Instant Feedback Adaptive Platform Using Streamlit & Gemini API For Skill-Based Improvement.

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Abstract - An AI-powered personalized learning platform is developed using Streamlit, Gemini API, and Python in a VS Code environment. It allows students to take interactive quizzes and receive instant feedback with explanations for both correct and incorrect answers. The system identifies learning gaps and offers focused insights to help students improve specific skills. With a smooth and responsive interface, the platform adapts to individual performance, making learning more effective and engaging. By combining intelligent feedback with real- time progress analysis, it creates a tailored educational experience that encourages continuous learning and helps students achieve better academic results.

Key Terms: AI-powered learning, personalized quizzes, Streamlit, Gemini API, and Python within a VS Code environment, the system focuses on learning gap analysis and skill-based improvement.

INTRODUCTION

In today's digital age, personalized education has become essential to address the diverse needs and learning styles of students. This project presents an AI-based Personalized Learning Platform developed using Streamlit, Python, and Gemini API, with code executed in a VS Code environment. The platform is designed to deliver a tailored learning experience by allowing students to take interactive quizzes and receive immediate feedback, including detailed explanations for correct and incorrect responses.The system intelligently analyzes quiz performance to highlight areas that require improvement, enabling a more focused and efficient learning process. With a clean and user-friendly interface, it ensures seamless interaction and real-time adaptability. The integration of artificial intelligence and smart analytics empowers students to monitor their progress, understand their strengths and weaknesses, and take control of their learning journey.

The way students learn is changing quickly with the support of new technologies. While many digital platforms are available, most still deliver the same Traditional education tools rarely use performance data to adapt to each learner. They also don't offer immediate feedback or flexible assessments that adjust to student progress. To solve these problems, this project introduces a smart learning platform that uses artificial intelligence to personalize education. It studies how each student performs, gives instant feedback, and adjusts quizzes based on their progress. The platform's goal is to provide a focused, engaging, and effective learning environment where students can improve at their own pace and achieve better academic results.

A. PROBLEM STATEMENT

Traditional Traditional education systems typically follow a fixed curriculum that doesn't accommodate the varied learning abilities and speeds of individual students. This rigid, one-size-fits-all model often causes difficulties in the learning process. Students who struggle with certain topics may become frustrated and lose confidence, while those who learn quickly may find the material unchallenging and disengaging. As a result, the traditional approach fails to optimize learning outcomes, limiting students' potential.

An AI-powered Personalized Learning Platform addresses these issues by using artificial intelligence to create tailored learning experiences. The platform analyzes student data, such as interactions, learning patterns, and areas of strength and weakness, to adjust study plans in real-time. It offers adaptive content, personalized recommendations, and continuous feedback. Key features like intelligent tutoring and interactive modules help students grasp concepts effectively. By focusing on individual needs, the platform enhances engagement, academic performance, and overall learning success.

content to all users, without considering their individual needs or learning pace.

B. Technology

1. Gemini API
2. Python
3. Mongo DB
4. 4.Streamlit

II. LITERATURE SURVEY

Personalized Adaptive Learning Technologies Based on Machine Learning Techniques to Identify Learning Styles

Pradeep, et. al (2024) In today's educational landscape, the integration of artificial intelligence (AI) is transforming how learning and teaching are conducted. This innovative project aims to reshape education by harnessing AI to provide a more customized and engaging learning experience. In this paper, we introduce an educational technology platform that leverages AI to replicate key functions of a human teacher, such as delivering lectures, offering personalized explanations using visual animations, and monitoring student engagement through webcam-based interactions. This project has multiple objectives. First, it seeks to bridge the gap between traditional teaching methods and the evolving needs of modern learners by creating a more personalized, AI-driven approach to education. Second, incorporating webcam monitoring helps ensure students remain attentive and actively participate during lectures.

AI-Based Learning Style Prediction

Rishard, et. al (2023) The paper introduces Adaptivo, an adaptive e-learning system designed to enhance personalized learning by tailoring content to fit each learner's unique style and knowledge level. Adaptivo creates a customized learning path by assessing two main factors: a student's preferred learning style and their existing knowledge in specific subjects. This approach allows the system to deliver material that aligns with each learner's cognitive preferences, helping them concentrate on new topics rather than revisiting familiar information. To personalize learning, Adaptivo begins with an initial assessment of a student's baseline knowledge in each subject. This way, students can skip content they already understand and focus on areas they need to develop. Additionally, Adaptivo considers

each learner's preferred way of processing information.

Self-Organizing Democratized Learning: Toward Large-Scale Distributed Learning Systems

Essa, et.al (2023) This paper provides an in-depth review of personalized adaptive learning technologies that use machine learning to understand and respond to individual learning styles. It systematically examines how different machine learning techniques are applied in educational platforms to enhance personalization, focusing on how these technologies adapt tovarious learning preferences.

Student Behavior Analysis to Detect Learning styles in Moodle Learning Management System

Maaliw, et. al (2021) This paper examines the transformative potential of deep learning in e-learning, focusing on how advanced AI techniques can make online education more personalized and effective. Deep learning, a branch of machine learning that utilizes neural networks to model complex data patterns, is particularly suited for adapting online learning experiences to meet the unique needs of individual learners. The study emphasizes how deep learning can analyze vast amounts of educational data to gain insights into students' learning behaviors, preferences, and challenges, ultimately allowing for a more customized learning journey. One key area explored is how deep learning algorithms can provide real-time feedback and guidance, helping students stay on track and adjust their study strategies as needed.

Deep Learning: The Impact on Future eLearning

Muniasamy and Alasiry, et. al (2020) This study aimed to evaluate the impact of Artificial Intelligence (AI) on education, focusing on its applications and effects in administration, instruction, and learning. Guided by a framework developed through preliminary analysis, the study employed a qualitative approach, specifically a literature review, to explore the role of AI in education. AI, a field that creates machines and systems capable of human-like intelligence, enables computers and

devices to exhibit cognitive abilities, learn, adapt, and make decisions. The study found that AI has become widely adopted in education, with institutions using AI in various forms over time. Initially, AI took the form of computer-based technologies, evolving to web-based and online intelligent systems. Today, AI encompasses advanced tools like humanoid robots and web-based chatbots, which can perform instructional duties independently or assist educators. Through these AI- driven platforms, educators can manage administrative tasks, such as reviewing and grading assignments, with greater efficiency and more accuracy is increased in this project which makes learning easy and it also provides the students with advanced knowledge which they needed.

Artificial Intelligence in Education

Ikawati, et. al (2020) This study investigates how analyzing student behavior within the Moodle Learning Management System (LMS) can help detect individual learning styles, with the goal of enhancing adaptive learning. The researchers examine how data from students' interaction such as login frequency, content engagement, quiz attempts, and forum participation can reveal preferred learning styles. By recognizing patterns in these activities, educators and developers can better customize learning.

III. EXISITING SYSTEM

Personalized learning platforms use advanced technologies and teaching methods to tailor education to each student. Early adaptive systems relied on fixed rules to change content based on learner profiles and test scores. Modern platforms apply machine learning to process student activity data, detect behavior patterns, and suggest material that aligns with each learner's strengths and improvement areas. Recommendation techniques like collaborative filtering offer resources by comparing similar users' preferences. Natural language processing powers virtual tutors and chatbots, delivering instant feedback and creating custom summaries. Gamification elements such as points and leaderboards support engagement. Learning analytics and predictive tools allow instructors to monitor progress, identify knowledge gaps, and offer tailored support. Reinforcement learning refines instruction by updating lessons based on real-time performance. Some systems also create custom quizzes and explanations. Data privacy concerns, scalability challenges, and

integration with existing educational systems remain critical issues to resolve.

A. Limitations:

1. **High Implementation Costs -**Setting up personalized learning platforms can be expensive due to the need for advanced software, hardware, and expert developers.

2. **Data Privacy Concerns -**These platforms collect a lot of student data, so protecting it from misuse or leaks is very important.

3. **Over-Reliance on Technology**- Depending too much on AI may reduce human interaction, which is important for emotional support and real-time guidance from teachers.

4. **Algorithmic Bias** - If the AI is trained on biased data, it might give unfair suggestions or results to some students.

IV. PROPOSED SYSTEM

This project follows a well-defined process to develop an AI-based personalized learning platform with a strong focus on quiz automation and performance tracking. The platform is built using Python and Streamlit, offering a clean, interactive interface for learners. Quizzes are automatically generated using AI, with questions tailored to course content and learner levels. Admins have full control to add, edit, or delete questions through a dedicated interface. Students can select a course and take quizzes, which dynamically adapt in difficulty based on their responses using reinforcement learning. Upon completion, quiz performance is analyzed and displayed, highlighting correct and incorrect answers along with a complete answer key. The system tracks student progress over time, storing quiz history and results in MongoDB. Visual progress charts help students monitor their learning journey and identify improvement areas.

A. Advantages:

• **Automated Quiz Generation-** AI generates relevant and varied quiz questions, reducing manual effort and saving time.

• **Personalized Learning Experience -** Quizzes adapt to each student's performance level, offering the right amount of challenge.

• **Real-Time Performance Tracking -** Students can instantly view quiz results and track their progress over time through visual graphs.

- **Admin Control Panel -** Admins can easily add, edit, or delete questions, making quiz management flexible and efficient.

- **Interactive and User-Friendly Interface -** Built with Streamlit, the platform offers a smooth and responsive experience for learners and educators.

- **Improved Engagement -** Dynamic quizzes and progress visualization keep students motivated and actively involved in their learning journey.

B. System Architecture
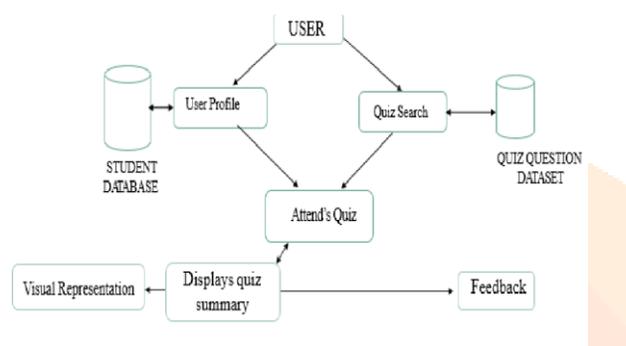
Figure 1 System Architecture of the AI -Based learning platform

This diagram represents the flow of a **Quiz Management System**.

The starting point A user interacts with the system.

1. User Profile: The user accesses or creates their profile, which is linked to the STUDENT DATABASE. This database stores user information such as login credentials, progress, and possibly quiz history.

2. Attend Quiz: After selecting a quiz, the user participates in it.

3. Displays Quiz Summary: Once the quiz is completed, the system shows a summary of the results, including score, correct/incorrect answers, etc.

5. Visual Representation: The summary can be presented visually (e.g., graphs or charts) to help the user better understand their performance.

6. Feedback: Based on the performance, the system provides feedback to the user, which could include areas to improve, suggestions, or motivation.

Summary of System Architecture:

- User starts by logging in or accessing their profile.

- Searches for a quiz from their dashboard.

- Takes the quiz.

- Views results and performance summary.

- Receives visual representation and feedback.

V. EXPERIMENTAL RESULT AND ANALYSIS

A. HOME PAGE

The Home page shows the main page of an AI-based quiz platform. On the left side, users can log in or switch to the registration option. The form requires a username and password to access the platform. The right section welcomes users and explains the app's purpose. It highlights features like AI-generated quizzes, performance tracking, and personalized insights. Users are encouraged to sign in or create an account to get started.

Figure 1

B. QUIZ PAGE

The Quiz Page allows users to take a quiz on the "History of Cholas." It shows the user's email and role on the sidebar, along with a logout option. The quiz progress is visually represented using a progress bar. It displays the time taken to complete the quiz. Each question is listed with multiple choice options. The selected answer is marked, and feedback is provided if the answer is correct or not. An explanation section appears below the question to offer context. Only one question is expanded at a time for a clean layout. The dark theme makes it easy on the eyes during long sessions. Overall, this page gives users an interactive quiz-taking experience.
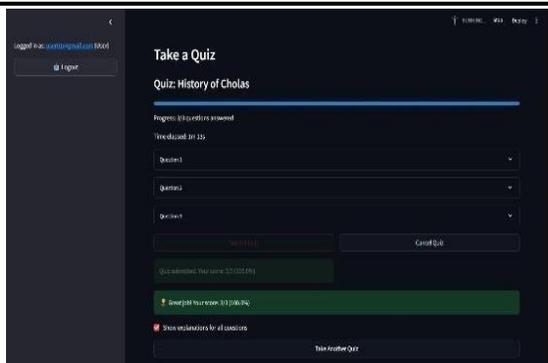
Figure 2

Figure 4

C. QUIZ PERFORMANCE

The Quiz Performance summarizes the quiz performance of the user. It includes data such as quizzes taken, questions answered, and correct responses. The average score is calculated and displayed as a percentage. A motivational message is provided based on the user's performance. The strengths and weaknesses of the user are analyzed. It highlights the user's strong focus on historical knowledge. Suggestions are provided under "Personalized Study Plan".
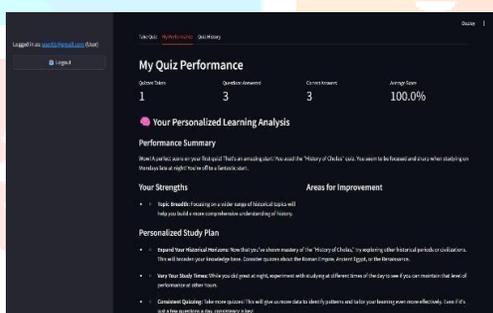
E. CREATING QUIZ QUESTIONS

The Creating Quiz Questions designed for admin users to generate new quiz content. Admins can enter the quiz topic and define prompts for the AI to generate questions. The number of questions to be generated can be set using a slider. A preview panel on the right shows the questions as they are generated. Each question includes four multiple-choice options, with one marked correct. Topics like "History of Cheras" can be added through this interface. There's a successful message confirmation once questions are created. The interface allows fast content creation with minimal manual effort. Admins can switch to managing questions or viewing quiz stats via the menu. It provides an efficient system

Figure 3

Figure 5

D. QUIZ HISTORY

The Quiz History provides a historical log of all quizzes attempted by the user. It lists the date, topic, score, and duration of each quiz. Users can select a specific quiz to view detailed insights. Once selected, the full quiz details including each question and answer are shown. Correct answers are marked, and user responses are indicated. The layout ensures easy navigation between past quizzes. Each question can be expanded to review answers. The user can see performance metrics like total score and time taken. The dark background helps maintain focus and readability. This page is essential for tracking academic progress over time.
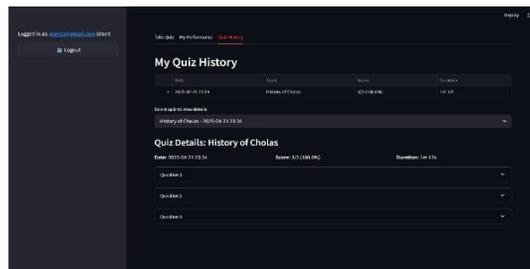
VI. CONCLUSION

The AI-based Personalized Learning Platform successfully addresses the limitations of traditional education by offering a smart, student-centered learning environment. By integrating technologies like Streamlit, Python, and the Gemini API, the system provides dynamically generated quizzes, performance tracking, and adaptive question difficulty tailored to individual learning levels. With features such as admin-controlled quiz management, real-time progress visualization, and AI-driven quiz generation, the platform ensures a more interactive and engaging learning experience. It empowers students to take control of their academic journey and helps educators efficiently monitor and manage assessments. Overall, the

project enhances the quality of digital education by combining personalization, automation, and accessibility, making learning more effective, flexible, and scalable for future use in academic institutions and beyond.

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