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SARA AI: An AI-Powered Platform for Automated Course Creation

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Abstract

The integration of Artificial Intelligence (AI) in e-learning has revolutionized the way educational content is delivered, personalized, and assessed. This sur- vey explores the role of AI-driven content generation in e-learning, focusing on its integration, trends, challenges, and future prospects. We categorize machine learning approaches, including traditional methods, deep learning, and hybrid models, and evaluate their application in enhancing personalized learning, adaptive assessments, and dynamic content delivery. Unlike conventional e-learning systems that rely on uniform content, AI-powered platforms offer tailored experiences by adapting to individual learners' strengths, weaknesses, and preferences. This capability im- proves engagement and outcomes, especially in large-scale online education. The study also addresses challenges such as scalability, data quality, and ethical considerations, while exploring trends like AI-assisted curriculum development and real-time feedback systems. Despite promising results, AI-driven e-learning systems face challenges in achieving optimal performance in diverse educational contexts, presenting areas for further re- search and enhancement.

Keywords: AI Content Creation, AI driven content generation, e- learning, deep learning, personalized learning, con- tent delivery, AI ethics

1. Introduction

The field of education has experienced significant growth in recent years, driven by the increasing demand for scalable, flexible, and uninterrupted learning solutions. The global pandemic accelerated the shift toward online education, highlighting the need for effective digital learning platforms. Among the most promising advancements is the integration of Artificial Intelligence (AI), which enhances learning experiences by personalizing content delivery. Unlike traditional e-learning systems that provide uniform content to all learners, AI-powered platforms adapt to individual learner's strengths, weaknesses, and preferences.

AI-powered personalized e-learning systems assess a learner's progress in real-time, adjusting content delivery accordingly. For example, a learner struggling with a topic may be given additional practice or alternative explanations, while a more advanced learner could be challenged with higher-level material. This adaptability is crucial for improving engagement and learning outcomes, particularly in large-scale online

education, where traditional methods often fail to address individual differences effectively.

Despite the potential benefits, implementing AI-driven personalized e-learning systems presents significant challenges. These include technical complexities such as real time data processing, building accurate recommendation systems, and ensuring that AI models can effectively assess a learner's comprehension across different subjects. Additionally, issues such as biases in AI models, data privacy concerns, and the scalability of these systems must be addressed to fully realize the potential of AI in education.

2. Literature review

The literature on AI-driven content generation in e- learning reveals significant advancements and ongoing challenges in the field.

The evolution of AI in education is categorized into several main types: personalized learning systems, adaptive learning systems, and hybrid systems, each employing different AI techniques to enhance the learning experience. A critical focus is on feature extraction, with traditional methods like Principal Component Analysis (PCA) being complemented by advanced techniques such as deep learning to improve efficiency and reduce computational complexity. The reliance on outdated datasets, such as KDD Cup 1999 and NSL-KDD, is identified as a limitation, prompting calls for contemporary datasets that reflect current learner interactions and educational trends. The literature on AI-driven content generation in e- learning reveals significant advancements and ongoing challenges in the field.

A comparative evaluation of unsupervised learning algorithms highlights the need for tailored learning methods for various educational contexts. Key algorithms discussed include k-Nearest Neighbors (k-NN), Random Forests, and Support Vector Machines (SVM). The findings suggest that while histogram-based methods excel in real-time applications, nearest neighbor algorithms generally outperform clustering methods, emphasizing the importance of selecting the right algorithm based on dataset characteristics. Several studies propose e-learning systems utilizing ma- chine learning techniques, such as Artificial Neural Net- works (ANN), to classify learner performance and adapt content accordingly. The integration of machine learning algorithms is shown to enhance personalization accuracy and reduce false positives in content recommendations. Feature selection techniques are emphasized as essential for improving model performance and reducing computational costs.

The potential of AI-driven adaptive systems in developing Intelligent Tutoring Systems (ITS) is explored, particularly for real-time feedback and personalized learning paths. Studies advocate for further exploration of AI protocols and their integration with advanced learning methodologies to enhance educational outcomes. The literature underscores the need for continued re- search into innovative e-learning solutions that leverage the unique capabilities of AI and machine learning to combat the challenges of modern education effectively. Challenges such as the complexity of learner data, class imbalance, and reproducibility of results are highlighted as areas requiring further investigation.

3. Methodology

The proposed system, SARA AI Course Generator, is de- signed to simplify the creation and management of educational courses by leveraging AI-powered content generation and customization. This project is a web-based system developed for users who can act as both course creators and learners. The system is built using React and Next.js for the frontend, with Firebase and

PostgreSQL for backend data management. The system integrates AI algorithms for automated course generation and provides a user-friendly interface powered by Tailwind CSS.

System Overview: The system allows users to create, customize, and explore courses. Users can generate courses by selecting topics, and the system automatically generates content, including videos, markdown descriptions, and code samples. The generated courses are saved in the database, and users can access, edit, or delete their own courses. Additionally, users can explore courses created by others, making the platform a collaborative learning environment.

User Interaction: Users interact with the system to create, customize, and explore courses. The system allows users to search for courses using text input. Users can enter keywords or filters, such as topic, difficulty level, or course duration, to find specific courses. The system retrieves courses even if only one word in the search query matches a part of the course title.

Course Generation Process: The course generation process involves the following steps:

1. Topic Selection: The user selects a topic for the course, and the system uses AI algorithms to generate relevant content, including videos, markdown descriptions, and code samples.

2. Content Formatting: The generated content is struc- tured into chapters and sections, providing a clear and or- ganized learning path for users.

3. Content Storage: The course content is saved in the database, and the file path is stored for future access. Course Customization: The system allows users to cus- tomize the generated courses by:

1. Content Editing: Users can modify the course materials, such as adding or removing sections, editing descriptions, or updating code samples.

2. Reordering Sections: Users can reorganize the course structure by rearranging chapters or sections to suit spe- cific learning needs.

3. Personalized Additions: Users can add their own notes, media, or additional resources to the course, enhanc- ing the learning experience.

Course Exploration: Users can explore and access courses created by other users through the following functionalities:

1. Shared Course Library: The system displays a library of courses created by other users, providing a wide range of learning materials.

2. Search and Filter: Users can search for specific courses using keywords or filters, such as topic, difficulty level, or course duration.

3. Course Preview: Users can preview a course before accessing it, allowing them to evaluate the content and structure.

Database Management: The system uses Firebase and PostgreSQL for database management, ensuring reliable data storage and retrieval. The database stores:

1. User Data: Login and profile details of users, ensuring secure access and personalized experiences.

2. Course Content: All generated and customized courses are stored in the database, allowing users to access their courses at any time.

3. Real-Time Updates: Any changes made to the course content are updated in real-time, providing a consistent experience for users.

4. Backup and Recovery: The system includes mechanisms for data backup and recovery to protect against data loss.

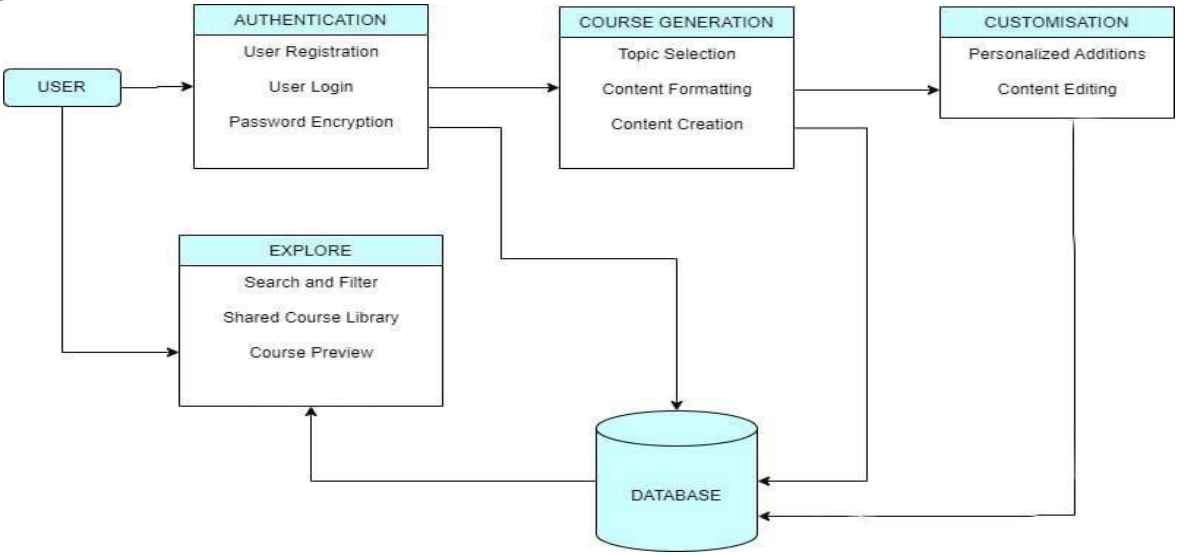


Figure 1: System Architecture

4. Results and Discussion

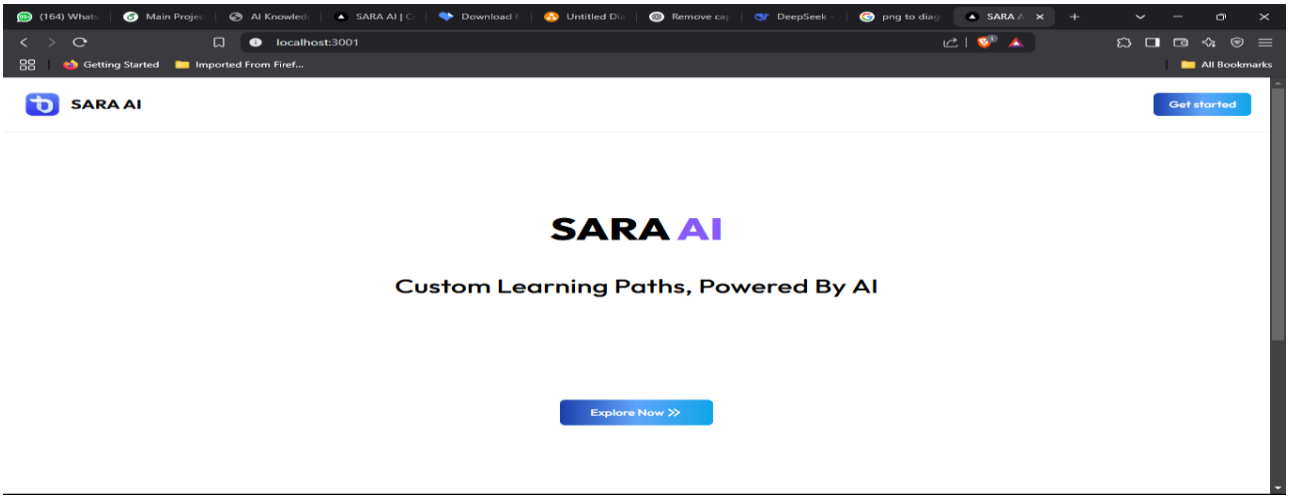


Figure 2: Landing page

Fig 2 shows the landing page which allows users to explore available courses, register to access platform, and manage their learning. The explore courses button provides an overview, while the register button unlocks course creation and customization features. Users can track progress, edit content, and revisit saved courses for easy access and up- dates.

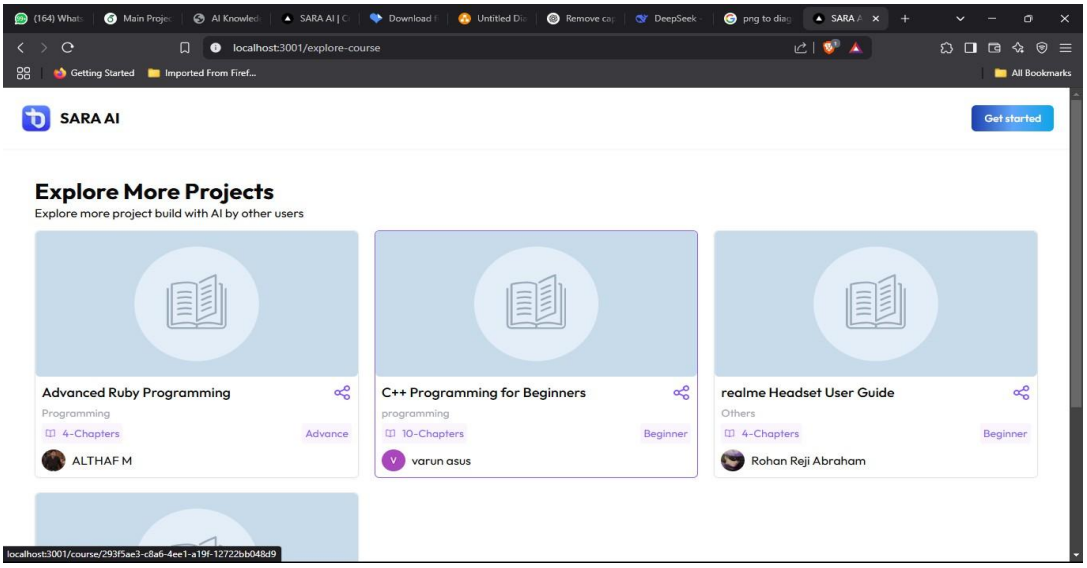


Figure 3: Explore Courses

The figure shows the course exploration page where the users and non-users can view and learn the courses created by other users.

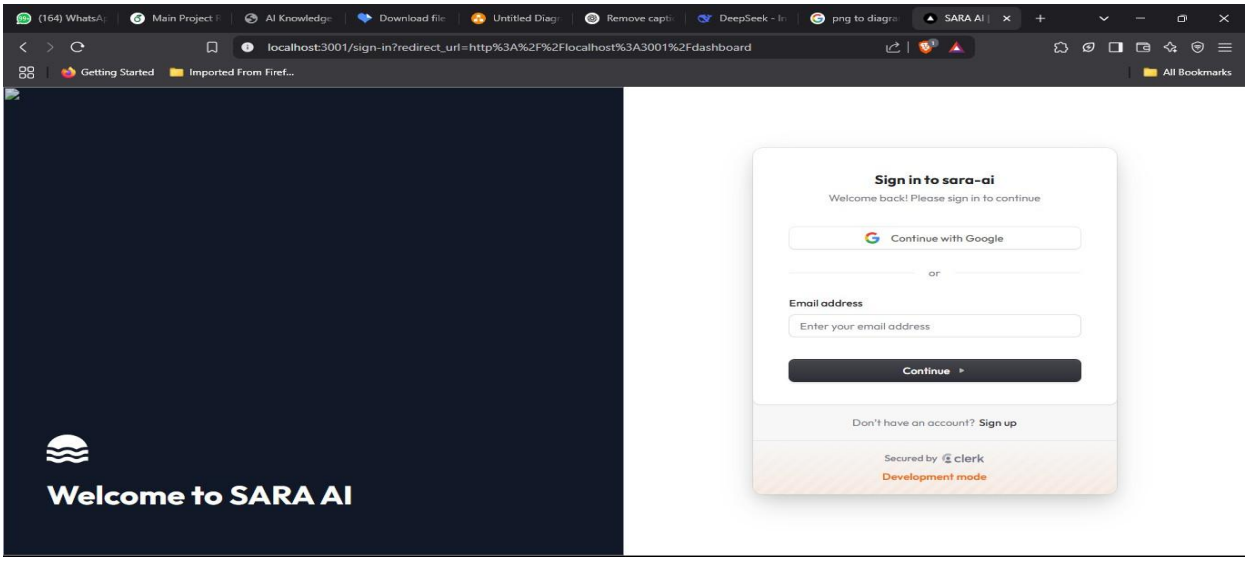


Figure 4: User login and registration

Fig 4 shows the user login page where users can register or login(if already registered) and access their learning re- sources.

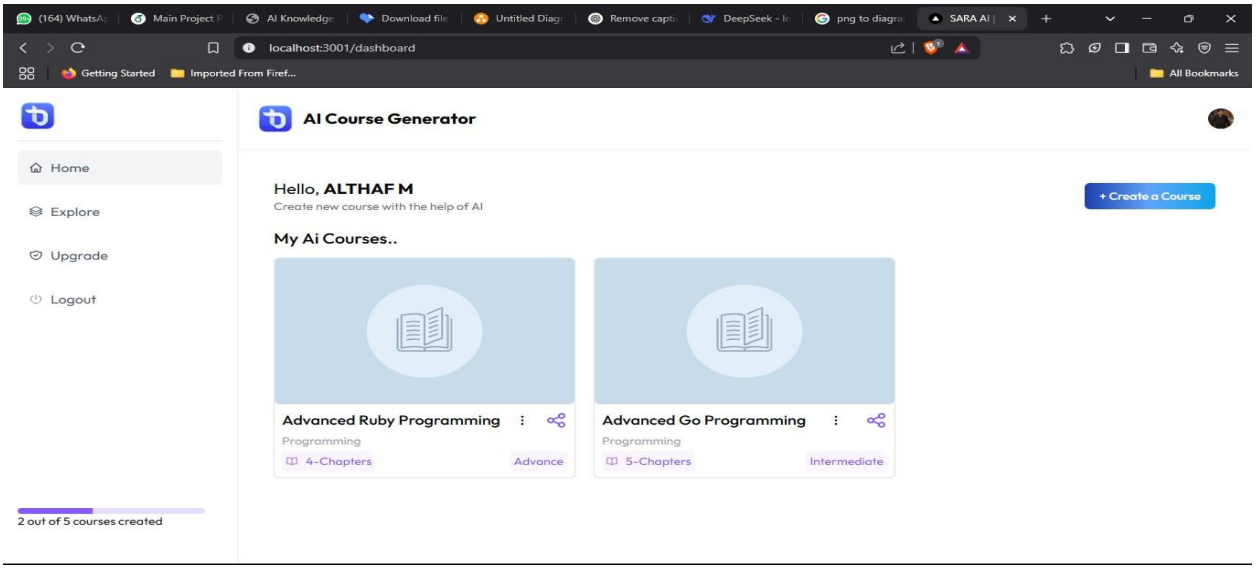


Figure 5: User Dashboard

The figure shows the user dashboard where the registered users can view and access the learning resources create by them and can also create new courses as needed.

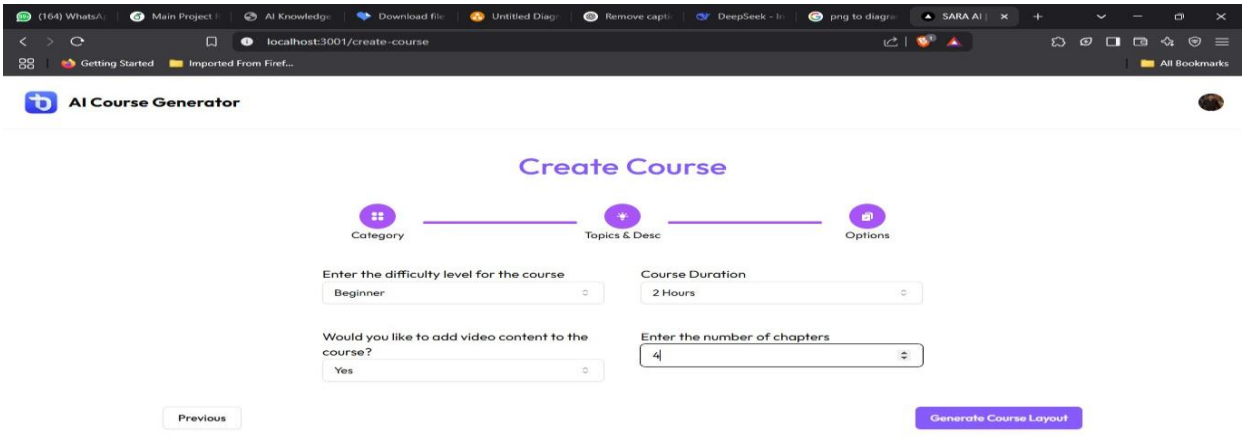


Figure 6: Details to create new course

The figure shows the details to be entered to create new and personalized courses including details like topic name, duration, time duration and difficulty level.

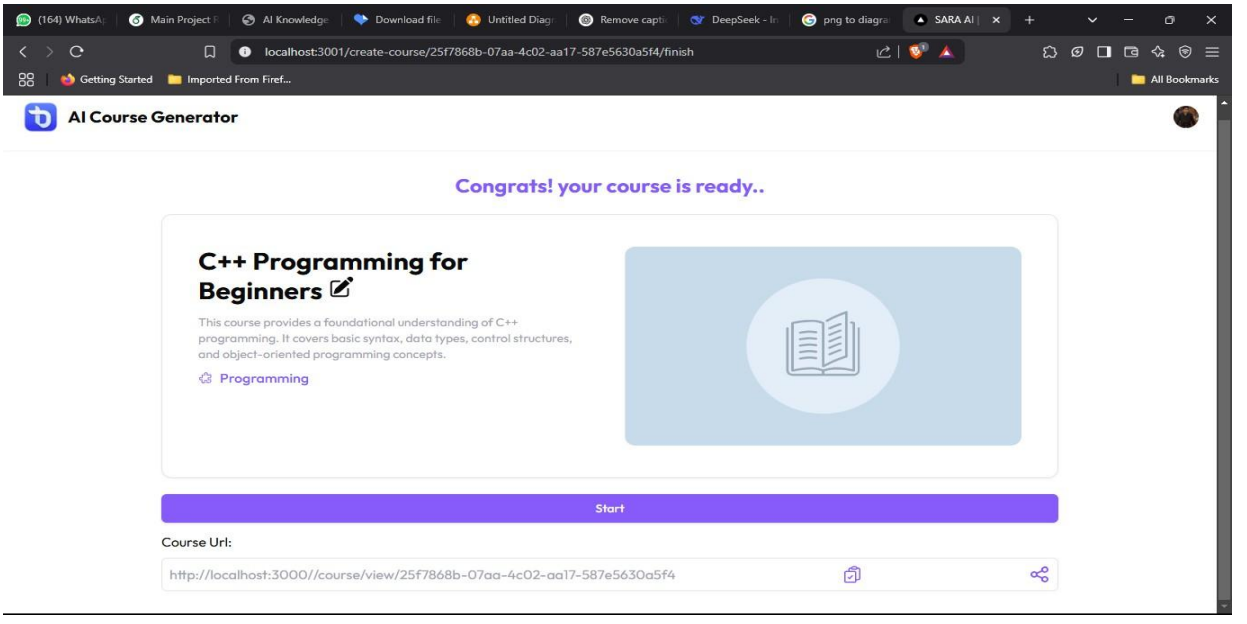


Figure 7: Generated page

Fig 7 shows the final course layout generated by the AI according to various user inputs, ratings, relevance and optimality.

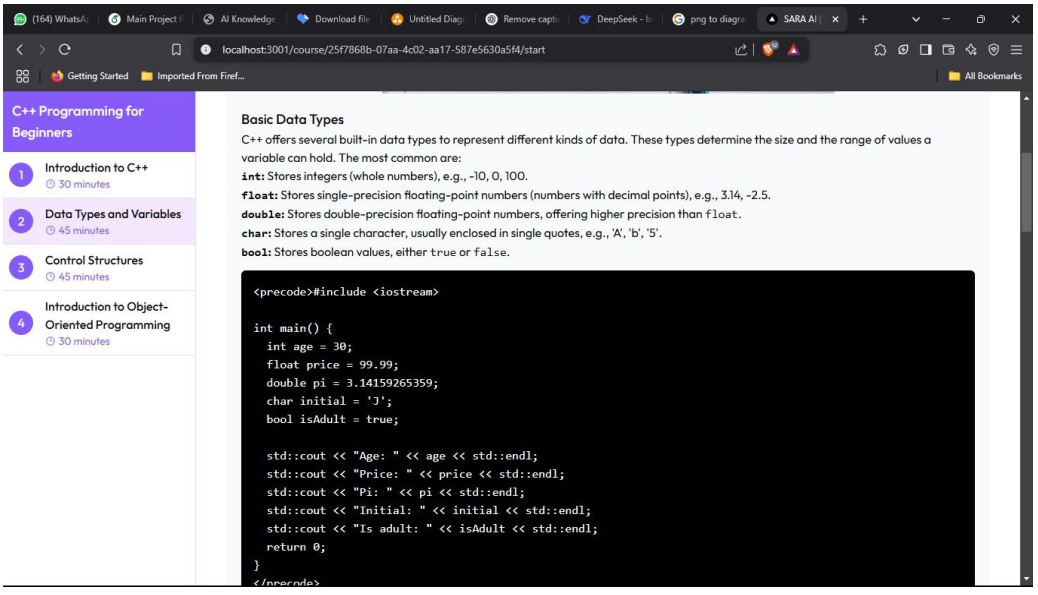


Figure 8: Course chapters

5. Conclusion

The SARA AI Course Generator represents a significant advancement in AI-driven e-learning, offering a user-friendly and efficient platform for creating, customizing, and exploring educational courses. By leveraging modern web technologies and AI algorithms, the system provides a personalized and engaging learning experience for users. The platform simplifies course creation, allowing users to generate structured content with ease, while also supporting extensive customization to cater to diverse learning needs. De- spite challenges such as data privacy concerns and the need for improved AI content quality, the system demonstrates the potential of AI in transforming education and making learning more accessible and effective.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship and publication of this article.

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