

**EDUVISTA AI: INTERACTIVE AI-BASED LEARNING MANAGEMENT SYSTEM****Dr. Mrs. Preeti Patil<sup>1</sup>**Head Of Department, Department of Information Technology, D.Y. Patil College of Engineering  
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**ABSTRACT**

The AI-Powered Learning Management Systems (LMS) project aims to develop an intelligent, web-based application designed to enhance the student experience in education. This application features a custom AI-powered chatbot capable of summarizing educational videos and providing real-time doubt resolution, facilitating a more interactive and efficient learning process. Leveraging tools like ffmpeg-python, Cloudinary and transformers, the system processes video transcripts to create concise summaries, supporting students in quick content revision, especially during exams. The process involves transcript retrieval, summarization through pipelining and Whisper, and displaying the reduced content, achieving over 70% reduction in transcript length. By addressing key technological, institutional, and user-related factors, this project seeks to provide valuable insights for integrating AI-driven solutions within web-based learning platforms, ultimately aiming to improve learning outcomes, increase student engagement, and transform the Indian higher education landscape.

**Keywords:**

Interactive Learning Enhancement AI-Driven Video Summaries, Exam-Oriented Content, Efficient Video-to-Text Processing, Course Performance Analytics.

**INTRODUCTION**

In recent years, as educational technology continues to evolve, AI-powered chatbots have emerged as transformative tools within learning management systems (LMS), particularly in enhancing the student experience. Traditional LMS models primarily focus on delivering course content and managing academic logistics but often fall short in providing personalized, real-time support that caters to diverse learning needs. This project aims to address this gap by developing a custom AI-powered chatbot specifically designed for web-based LMS in Indian higher education institutions. With key features like video summarization and real-time doubt resolution, the chatbot seeks to provide an interactive, efficient, and accessible learning experience, fostering greater engagement and academic support for students. The chatbot leverages advanced video-to-text processing, using tools such as ffmpeg-python and Cloudinary, to retrieve and summarize educational videos. This allows students to quickly review key content, especially during exam periods, by condensing video transcripts into concise summaries. In addition to academic assistance, the chatbot also automates administrative tasks—such as reminders for assignment deadlines and class schedules—enabling students to better manage their academic responsibilities. Through this integration of technology, the chatbot addresses both educational and administrative aspects of the student journey, contributing to a more holistic support system within LMS. This study further investigates the factors that influence the adoption and effectiveness of chatbot technology in Indian higher education. By examining technological, institutional, and user-related factors, the project aims to uncover critical insights into how AI-driven solutions can be seamlessly incorporated into existing web-based platforms. In doing so, this project contributes to the broader transformation of Indian higher education by leveraging innovative AI solutions tailored to the unique needs of its students and institutions.

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### OBJECTIVES

To enhance student engagement and boost academic performance, implement a 24/7 AI chatbot that offers video summaries, doubt resolution, and comprehensive learning support. This always-accessible assistant will allow students to instantly clarify doubts outside of class hours, ensuring continuous learning without delays. Furthermore, the chatbot will provide curated, topic-specific resources designed for interview preparation, helping students develop relevant skills and confidence. It will also simplify access to a wide range of verified educational materials, minimizing the time spent searching for reliable information. To create an engaging user experience, the platform will feature an intuitive, user-friendly interface that guides students to resources seamlessly. Personalized recommendations and adaptive feedback can further support individual learning paths, making the platform a valuable tool for academic growth and success.

### SYSTEM ARCHITECTURE

The Eduvista-AI ed-tech platform is structured around three primary components: the front end, the back end, and the database. It operates on a client-server architecture, where the front end functions as the client, while the back end and database are managed on the server side.

#### 1. Front End:

The front end of the platform is developed using ReactJS, a widely-used JavaScript library for constructing user interfaces. ReactJS enables the creation of dynamic and responsive interfaces, which are essential for delivering an interactive and engaging learning experience for students. Communication between the front end and back end is facilitated through RESTful API calls.

The front end of Eduvista-AI encompasses several essential pages tailored for different types of users. These include:

#### For Students:

- **Homepage:** Provides an introduction to the platform, including links to the course list and user details.
- **Course List:** Displays all available courses, along with their descriptions and ratings.
- **Wishlist:** Shows the courses that a student has added to their wishlist.
- **Cart Checkout:** Allows students to complete the course purchase process.
- **Course Content:** Presents the content for a specific course, including videos and supplementary materials.
- **User Details:** Contains account details such as the student's name, email, and other relevant information.
- **User Edit Details:** Enables students to update their account information.
- **Video Summarization:** Students can view summarized content of video lessons to grasp key points quickly.
- **Interview Question Generator:** A feature that suggests interview questions related to specific topics, helping students prepare effectively.
- **Reference Suggestions:** The platform provides relevant references to support learning and further research on topics.
- **Review Feature:** Students can leave reviews for courses, helping future learners make informed decisions.

#### For Instructors:

- **Dashboard:** Offers an overview of the instructor's courses, including ratings and feedback.
- **Insights:** Provides detailed analytics on the instructor's courses, such as views, clicks, and other key metrics.
- **Course Management Pages:** Allow instructors to create, update, delete courses, and manage course content and pricing.
- **View and Edit Profile Details:** Allows instructors to view and modify their account information.

#### For Admin:

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- Dashboard: Presents an overview of the platform's courses, instructors, and students.
- Insights: Offers detailed metrics on platform performance, including registered users, courses, and revenue.
- Instructor Management: Enables the admin to manage instructors' accounts, courses, and ratings.
- Other Relevant Pages: Admins can also access user management and course management pages.

The front-end development takes place in Visual Studio Code (VSCode), a popular code editor.

### 2. Back-end:

Eduvista-AI follows a monolithic architecture, with the backend developed using Node.js and Express.js, and MongoDB serving as the primary database. A monolithic architecture is characterized by the integration of all application modules into a single, unified program, maintaining a single codebase. This design promotes better control, security, and performance.

Node.js is a widely-used JavaScript runtime that enables the execution of JavaScript code outside the browser. Express.js is a web application framework built on Node.js, which simplifies the process of developing web applications. MongoDB is a popular NoSQL database that offers flexible data storage and retrieval, making it an ideal choice for complex applications such as Eduvista-AI.

The back end of Eduvista-AI is designed to provide several key features and functionalities, including:

- User Authentication and Authorization: The platform supports student and instructor sign-ups and logins using email and password. Additionally, it offers OTP (One-Time Password) verification and forgot-password functionality for enhanced security.
- Course Management: Instructors can create, read, update, and delete courses, as well as manage course content and media. Students have the ability to view and rate courses.
- Cloud-based Media Management: Eduvista-AI uses Cloudinary, a cloud-based service for managing media content such as images, videos, and documents.
- Markdown Formatting: Course content is stored in Markdown format, facilitating easier rendering and display on the front end.
- Video Summarization: AI-powered video summarization generates concise course video summaries, providing key insights.
- Chatbot Model: A chatbot model offers real-time assistance to students, answering questions related to courses and accounts.

### 3. Database Schema:

The back end of Eduvista-AI employs several data models and database schemas to manage and organize data effectively.

These include:

- Student Schema: This model includes key fields such as name, email, password, and course details associated with each student.
- Instructor Schema: Similar to the student schema, the instructor model contains fields such as name, email, password, and the courses taught by the instructor.
- Course Schema: This schema defines the structure for courses, with fields including course name, description, instructor details, and associated media content.

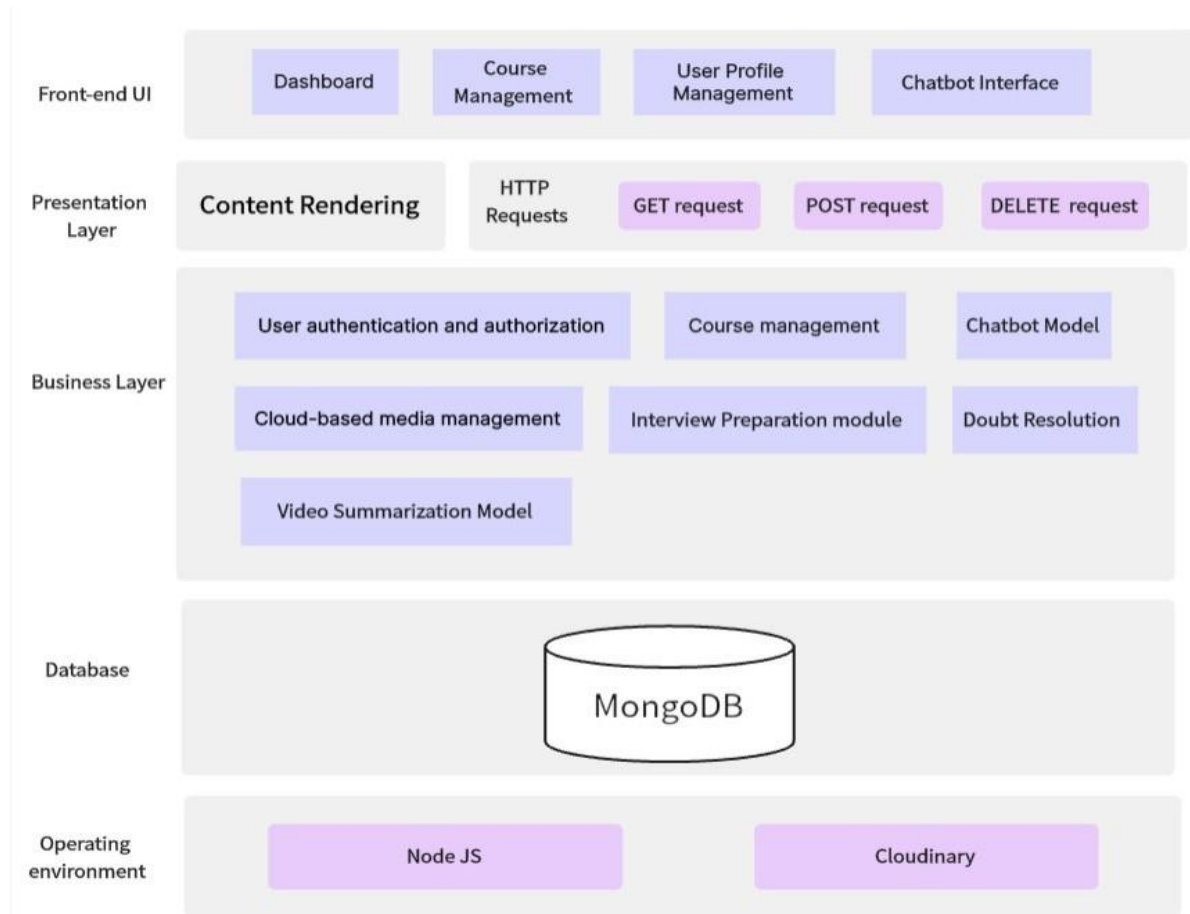
Overall, the back end of Eduvista-AI is designed to offer a robust, scalable solution for an ed-tech platform, emphasizing security, reliability, and ease of use. By leveraging appropriate frameworks, libraries, and tools, we ensure that the platform operates smoothly and delivers an optimal user experience for all stakeholders.

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*Figure 1.1 System Architecture*

#### 4. Frameworks and Libraries:

- Node.js: Used as the primary runtime for server-side development.
- MongoDB: The primary database, offering flexible and scalable data storage.
- Express.js: A web application framework for building efficient server-side applications.
- JWT (JSON Web Tokens): Used for secure authentication and authorization, managing user credentials.
- Bcrypt: A library for hashing passwords, adding an extra layer of security.
- Mongoose: An Object Data Modeling (ODM) library to interact with MongoDB using JavaScript.
- Tools and Dependencies:
- Cloudinary: A cloud-based service for media management (images, videos, documents).
- Google Cloud Speech: A tool for speech-to-text functionality.
- Transformers: A library for natural language processing tasks, used here for text summarization.
- FFmpeg: A multimedia framework for processing audio and video files.
- Whisper: An open-source tool by OpenAI for automatic speech recognition (ASR) and transcription.

## LITERATURE SURVEY

[1] The paper titled “EdTech Platform using MERN Stack” by Sakshi Bhokare et al. explores the development and impact of an educational technology (EdTech) platform, StudyNation, which integrates various tools and

interactive features to enhance the learning experience. Built using the MERN stack (MongoDB, ExpressJS, ReactJS, and NodeJS), StudyNation relies on a client-server architecture to ensure responsiveness, scalability, and engaging educational interactions. The platform addresses limitations of traditional educational systems by focusing on personalized learning, a need highlighted in recent studies emphasizing EdTech's role in fostering inclusivity. Hubalovsky et al. (2019) found that adaptive e-learning approaches can improve student engagement and outcomes by creating personalized pathways based on individual learning preferences. Similarly, Rahayu et al. (2022) underline the importance of ontology-based recommender systems in e-learning, which curate content based on students' needs—a design aspect integral to StudyNation.

StudyNation's feature set includes multimedia content management, real-time collaboration tools, and secure authentication, positioning it within the modern trend toward interactive, student-centered learning models. Bozkurt et al. (2021) discuss AI-driven personalization, which uses adaptive algorithms to address unique student requirements in real-time, a direction that StudyNation could explore further to enhance its adaptive capabilities. Additionally, StudyNation goes beyond conventional Learning Management Systems (LMS) by incorporating version control and content history tracking, offering educators greater flexibility. However, as noted by Zawacki-Richter et al. (2019), integrating AI and personalized learning entails addressing privacy and security challenges, especially due to the sensitive nature of educational data. StudyNation addresses these concerns through robust authentication measures, with plans to integrate data encryption in future updates

[2] The paper titled "Video Summarization Using Natural Language Processing and Machine Learning" presents a video summarization system designed to process YouTube video transcripts using Natural Language Processing (NLP) and Machine Learning techniques. With the increasing volume of videos on platforms like YouTube, it has become essential to develop systems that can efficiently extract key information from these videos. The proposed system retrieves the transcript from a video using an API, then applies NLP techniques such as extractive and abstractive summarization to condense the text without losing critical details. The approach utilizes Hugging Face's transformers and pipelining to generate summaries, offering a quick and accurate solution to handle large volumes of educational content on YouTube.

The methodology of the system involves several steps, including data preprocessing, emotion extraction, and transcript summarization. The authors use Python APIs to fetch video transcripts and apply various summarization techniques, which significantly reduce the transcript length while preserving its core content. The system shows a reduction in transcript length by over 70%, providing an efficient solution for users who need quick access to summarized video content. The results demonstrate the effectiveness of the proposed system in summarizing video content without losing key information, making it a valuable tool for educational platforms. Future work may explore further improvements in the model to enhance its accuracy and expand its functionality.

[3] The paper titled "E-LEARNING SYSTEMS: A REVIEW" by Samir R. Thakkar, Dr. Hiren D. Joshi explores how flexible and immersive e-learning environments foster engagement among IT professionals, enhancing their learning experiences. It discusses the integration of SCORM standards, which improve accessibility, interactivity, and content reusability across diverse Learning Management Systems (LMS), thus enabling professionals to learn at their own pace while interacting effectively with the course materials. The study also emphasizes the importance of robust document management and annotation features, which allow students to engage with educational content more actively. By incorporating multimedia elements such as videos, audio, and interactive activities, the paper argues that retention and engagement are significantly improved, making virtual education more effective and appealing. The research further explores how these advancements in e-learning not only provide personalized learning experiences but also support the scalability of education by enabling broader access to IT professionals globally. Moreover, the paper highlights the role of

adaptive learning technologies in customizing educational experiences to meet individual learning styles and needs.

[4] The paper "A Survey on Video Summarization Techniques" by Mahesh Kini M and Karthik Pai provides an extensive analysis of various methods in video summarization, addressing the challenges posed by the rapid growth of digital video content. As video data from sources like news, sports, and security cameras continue to increase, video summarization techniques are essential for enabling efficient storage, processing, and retrieval. These methods help users quickly access key portions of a video without needing to view the entire content. The paper introduces two primary types of video summarization: static video summarization, which extracts key frames, and video skimming, which produces a short video summary by selecting crucial scenes. Both methods aim to provide users with meaningful content while ensuring that the speed and sequence of events remain intact. Static summarization involves the extraction of key frames, while dynamic summarization incorporates both video and audio data to generate summaries that are easy to comprehend. The paper further delves into the techniques used in static and dynamic video summarization. It discusses methods like key frame extraction, where frames are selected either uniformly or randomly, and video skimming, which includes methods such as motion models, single value decomposition, and semantic analysis to identify key moments. In addition, video summarization techniques based on motion, color, and event-based methods are explored. Motion-based summarization focuses on the movement of objects or camera motion, while color-based methods analyze the color histograms of video frames to detect scene changes. Event-based summarization identifies significant moments in the video, such as goals in sports or actions in a lecture, through the analysis of pixel differences and energy calculations. The study offers a comprehensive view of the advancements in video summarization, emphasizing their importance in efficiently processing and accessing large video datasets.

[5] The paper titled "Adoption of AI-Chatbots to Enhance Student Learning Experience in Higher Education in India" examines the integration of AI-based chatbots in the Indian higher education system to improve student learning experiences. The study highlights how AI tools, particularly chatbots, are becoming increasingly essential in various sectors, including education, as they offer a more efficient, interactive, and personalized approach to communication and learning. In education, AI chatbots are transforming the traditional, instructor-centered model into a student-centered, interactive learning environment, facilitating not only communication but also personalized learning assistance. Chatbots are designed to handle administrative queries, provide real-time support, and even engage students in learning through tasks such as assessment and feedback, thus reducing the ambiguity often present in traditional educational settings. The paper underscores the growing acceptance of AI in education, particularly through the adoption of chatbots that can provide tailored learning experiences and improve student engagement. The research gathered data from 47 students across various institutions using surveys, with questions focusing on demographics, chatbot usage, and student preferences. It explores how chatbots can address current challenges in the educational system, such as teacher shortages, by providing efficient teaching assistance and improving productivity. The study also compares the traditional education system with the AI-driven chatbot system, noting that while traditional models rely heavily on passive learning and instructor-driven methods, AI chatbots create adaptive, personalized learning environments that encourage active student participation.

[6] The paper "Creating Educational Web Sites" by Junichi Azuma focuses on the challenges faced by educators in developing their own educational websites, particularly in the context of teaching English as a foreign language in Japan. It highlights several issues, such as the difficulty in finding suitable teaching materials, the lack of updates on educational websites, and the challenge of maintaining personal educational websites. The paper stresses the importance of educators creating their own original, web-based teaching materials to overcome these difficulties. It provides examples of interactive materials, such as rapid reading exercises and quiz-based feedback, to showcase how these resources can be utilized effectively in teaching.

Additionally, the paper suggests the development of web-based teaching materials that can be accessed through a campus intranet system, allowing students to access resources both in the classroom and from home. The creation of simple, manageable web materials using tools like HTML and Front Page98 is discussed, with the goal of keeping the materials accessible and easy to navigate. The issue of organizing an increasing number of documents is addressed through the use of the Hyper wave Information Server, which helps streamline the organization and navigation of educational resources, making it easier for both students and educators to access and manage materials.

[7] The research explores various advancements in educational technology and video summarization systems. One study discusses the development of an EdTech platform built using the MERN stack, which enhances personalized learning and engagement through features such as real-time collaboration tools and secure authentication. This platform aligns with trends in adaptive e-learning, focusing on personalized pathways and AI-driven recommendations to improve student outcomes. Another paper presents a video summarization system that uses Natural Language Processing (NLP) and machine learning to condense YouTube video transcripts while retaining key information, offering a valuable tool for educational platforms managing large volumes of content. A review of e-learning systems highlights the integration of SCORM standards, multimedia elements, and adaptive learning technologies to improve engagement and scalability in IT education. Other research delves into video summarization techniques and AI integration in education.

The study also discusses challenges in shot detection and highlights the use of clustering algorithms like k-means for identifying key frames. Another study examines the adoption of AI-driven chatbots in Indian higher education, where chatbots are being used to provide personalized learning experiences, assist with administrative tasks, and improve student engagement. Lastly, research on creating educational websites for teaching English as a foreign language emphasizes the challenges educators face and suggests developing simple, interactive web-based teaching materials while organizing educational resources effectively using systems like the Hyperwave Information Server.

[8] The integration of chatbots for generating interview questions is gaining momentum in various sectors, including education. Leveraging AI-driven chatbots can significantly enhance the process of preparing tailored interview questions based on specific roles, topics, and candidate backgrounds. The chatbot's ability to prompt detailed and context-specific interview questions can help in simulating realistic interview scenarios for candidates, fostering both learning and skill development. Chatbots can be utilized not just for basic Q&A, but for creating dynamic question sets based on the candidate's profile, role, and the desired job requirements. This can be especially valuable for technical or educational domains, where the focus is on assessing subject matter expertise or teaching skills. In addition, chatbots can offer personalized learning experiences by encouraging candidates to practice their responses to various questions in a low-stakes, repeatable environment. This helps refine communication skills, particularly in areas like language proficiency or technical knowledge, all while allowing for feedback collection and performance tracking. Thus, incorporating AI-driven chatbots to suggest interview questions not only optimizes the process but also provides valuable insights into candidate readiness, improving the overall recruitment process.

[9] The integration of AI chatbots for suggesting reference links, such as official documentation, educational videos, or other relevant resources, is increasingly popular in modern Learning Management Systems (LMS). By analyzing the user's query or topic of interest, the chatbot can automatically generate and present customized links to trusted and educational resources. This improves the learner's ability to quickly access reliable content, whether it's official software documentation, tutorial videos, or academic research. Chatbots that provide curated learning resources help students find the most relevant materials, as highlighted by Luu et al. (2020). Additionally, natural language processing (NLP) techniques can enhance the accuracy of these recommendations, ensuring they match the student's expertise or the complexity of the topic. This approach not

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only supports learners in accessing the right content but also streamlines the learning process, saving time and making learning more efficient. In addition to providing learning resources, AI chatbots also play a key role in doubt resolution. These chatbots can act as virtual teaching assistants, offering real-time help with academic questions, explanations, and problem-solving. Research by Chu et al. (2018) shows that chatbots can handle a wide range of academic topics, providing tailored explanations that address the learner's specific needs. Furthermore, as noted by Lee et al. (2019), chatbots improve over time by learning from previous interactions, enabling them to offer increasingly accurate and personalized responses. This 24/7 availability helps students resolve doubts at any time, reducing dependency on instructors and enhancing the overall learning experience.

[10] The feature of analyzing student reviews in an LMS to provide insights into course quality and instructor performance is gaining attention in educational research. The first part of this feature involves generating a short description based on reviews that helps prospective students make informed decisions when purchasing courses. This approach allows learners to quickly grasp the strengths and weaknesses of a course by summarizing feedback from past students. Research has shown that learning analytics can be leveraged to track and evaluate student engagement and performance, which can then be integrated with reviews to offer meaningful insights for future learners (Iwendi et al., 2022). By using advanced analysis techniques, such as data visualization and semantic analysis, LMS platforms can provide more accurate and helpful course descriptions, improving the decision-making process for students.

### CONCLUSION

In conclusion, this research presents an innovative approach to enhancing the educational experience through the integration of a custom AI-powered chatbot into a web-based learning management system (LMS). Designed to address critical challenges in contemporary education—such as accessibility, engagement, and personalized support—the proposed system offers key functionalities, including video summarization, real-time doubt resolution, and automated academic assistance. By employing advanced tools like ffmpeg-python, Cloudinary, and AI-driven summarization techniques, the chatbot delivers a responsive and efficient learning environment that caters to the unique needs of each student, ultimately supporting improved learning outcomes and academic success. This study also acknowledges the technical and ethical considerations that accompany the adoption of chatbot technology in educational settings. Challenges such as ensuring reliable real-time assistance, safeguarding user privacy, and delivering accurate content across diverse learning environments highlight the complexities involved in integrating AI within education. While the system demonstrates the potential of AI to improve educational experiences, it also raises critical considerations that must be addressed for its successful implementation. The main challenges include ensuring consistent performance across diverse educational environments, protecting user privacy, refining the accuracy of AI responses, and overcoming institutional resistance to technology adoption. Moreover, ensuring the ethical use of AI, particularly regarding student data security and privacy, is essential for building trust and encouraging widespread adoption. Addressing these concerns will be fundamental to overcoming barriers and enabling the widespread use of AI-powered chatbots in educational systems.

Overall, this research offers valuable insights into the implementation of AI-based solutions in higher education, particularly within the Indian context. By exploring technological, institutional, and user-related factors that influence chatbot adoption, this study lays a foundation for future advancements in AI-driven learning tools.

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