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EDUVISTAAI: INTERACTIVE AI-BASED LEARNING MANAGEMENT SYSTEM

Dr. Mrs. Preeti Patil
Head Of Department, Department of Information Technology,
D.Y. Patil College of Engineering Akurdi, Pune

Priyanka Patil
Pankaj Kshirsagar
Shravni Dhokare
Vishwajeet Phalke
UG student, Department of Information Technology,
D.Y. Patil College of Engineering Akurdi, Pune

ABSTRACT
EduVistaAI is a web-based Learning Management System that enhances digital education through AI-powered video summarization and interactive question-answering based on lecture content. The platform enables efficient access to concise video summaries, improving students' understanding and engagement. It supports secure authentication, easy registration, and structured course navigation. Technologies like FFmpeg, Deepgram, Gemini 1.5 Flash, and Cloudinary are integrated to enable video processing, transcription, and summarization. Instructors can manage courses and track student progress, while students benefit from focused content and interactive doubt resolution based on video material. This research demonstrates EduVistaAI's potential to improve accessibility and learning outcomes in modern education.

Keywords:
Learning Management System (LMS), Artificial Intelligence (AI), Video Summarization, Interactive Q&A, Educational Technology, Gemini 1.5 Flash, Deepgram, FFmpeg

INTRODUCTION

The rapid advancement of educational technology has significantly reshaped higher education, with Learning Management Systems (LMS) playing a pivotal role in enabling digital learning [1]. While conventional LMS platforms facilitate online education, many still lack effective tools for summarizing lengthy video lectures and providing interactive support based on content, which can hinder students' ability to review and understand complex topics efficiently [2]. Students often face difficulties in accessing concise lecture content and clarifying doubts in real time, especially outside scheduled class hours, affecting their academic performance and preparation for exams.

To address these challenges, this research presents EduVistaAI, an AI-powered interactive LMS designed to improve student learning through video summarization and content-based interactive question answering [3]. The platform integrates advanced video processing tools to generate concise summaries from lecture videos, enabling students to grasp key concepts quickly. It also offers an interactive Q&A feature that helps students resolve doubts by referencing the summarized video content. EduVistaAI provides essential LMS features such as secure user authentication, course enrollment, progress tracking, and evaluation management to create a comprehensive and user-friendly learning environment [4].

OBJECTIVES

This study aims to:

- Develop a user-friendly LMS interface for students and instructors.
- Integrate AI-driven video summarization to provide concise lecture summaries, improving accessibility and study efficiency.
- Implement interactive Q&A functionality based on lecture content to facilitate timely doubt resolution.

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- Deliver core LMS features including course tracking, assessments, and enrollment management.

By combining AI-powered video summarization and interactive support with fundamental LMS capabilities, EduVistaAI seeks to enhance student engagement, accessibility, and learning outcomes in modern digital education [5].

METHODOLOGY

The development of EduVistaAI is rooted in research across Learning Management Systems (LMS), Artificial Intelligence (AI) in education, video summarization, and user experience (UX) design [6]. This foundation addresses limitations in traditional LMS platforms, specifically their lack of advanced tools for video summarization and interactive doubt resolution. AI advancements, including Natural Language Processing (NLP) and speech-to-text models, are central to efficient content summarization and interactive question-answering systems [7, 8]. The design prioritizes an intuitive user interface (UI) to enhance engagement and usability [9,10]. This integrated approach aims to create a more personalized and effective learning experience.

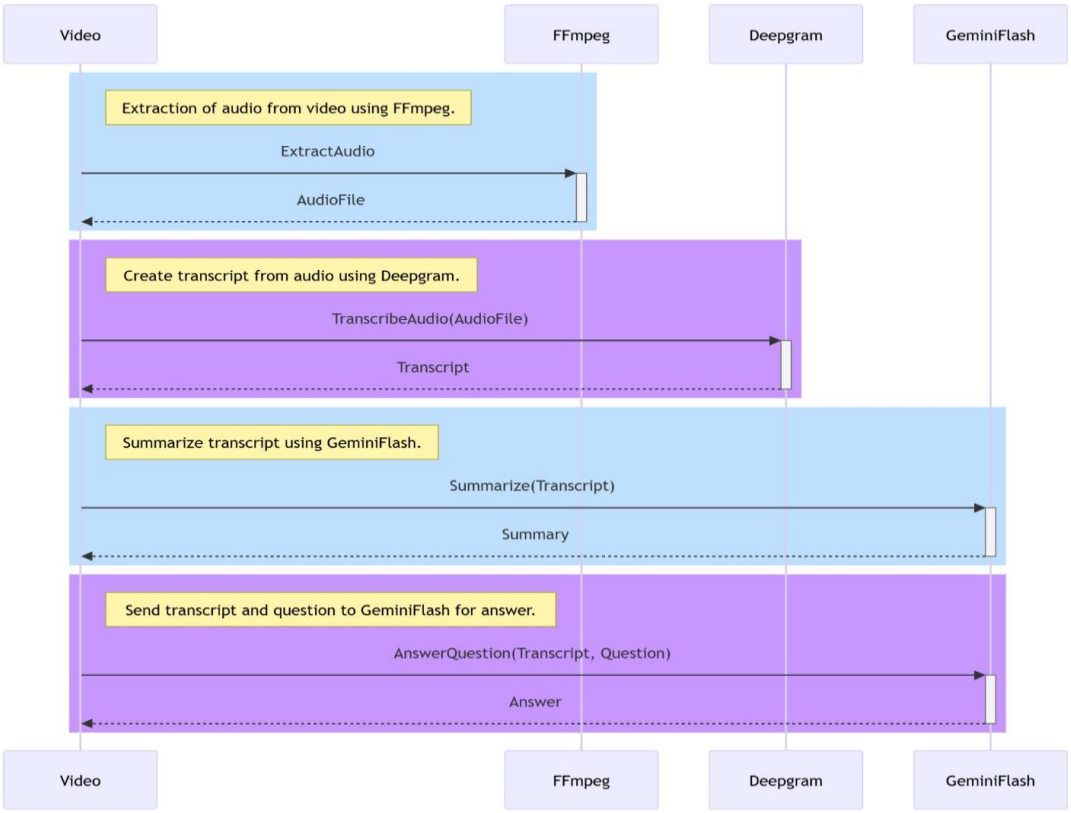

Fig 1: Video Processing and AI Interaction Sequence

Implementation.

The implementation of EduVistaAI was meticulously engineered to cater to the specific needs of educational institutions in Pune, Maharashtra. The design emphasizes accessibility, robust user engagement features, and stringent security protocols to ensure a comprehensive and effective digital learning environment.

User and Course Management

The platform incorporates a secure user registration and authentication system. Upon signing up, users provide personal and contact details, which are verified through an OTP (One-Time Password) sent to their registered mobile number, ensuring a legitimate and secure registration process [11]. After successful registration, users

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are directed to customized role-specific dashboards—one for instructors and another for students—reflecting their unique functionalities and access rights within the platform. A robust login system ensures authenticated access, with secure mechanisms for password recovery via email, maintaining high account security throughout the user journey [12].

A dynamic and organized course catalog and management system is a cornerstone of EduVistaAI. Instructors possess the capability to create new courses, structure them into sections and subsections (representing individual lectures), and seamlessly upload diverse multimedia materials, including video lectures, notes, and assessments. This modular approach provides flexibility in course delivery and organization. Instructors can also actively monitor student progress within each course, tracking assignments, quizzes, and overall performance. Concurrently, students can easily browse the well-organized, searchable course catalog, equipped with detailed course descriptions, to find and enroll in courses that align with their academic interests and career goals through a seamless process [13].

An impactful ratings and reviews system is integrated, allowing students to provide ratings and detailed feedback on their learning experience after completing a course. This feedback mechanism serves multiple purposes: it helps prospective students make informed decisions when selecting courses, and it provides instructors with valuable insights into course perception, enabling continuous improvement of content and delivery. This transparent, student-driven approach promotes accountability and helps maintain high standards in course offerings [14]. Additionally, EduVistaAI allows users to manage their profiles, update personal information, set preferences, and securely change passwords via an intuitive interface, ensuring ease of use without usability issues.

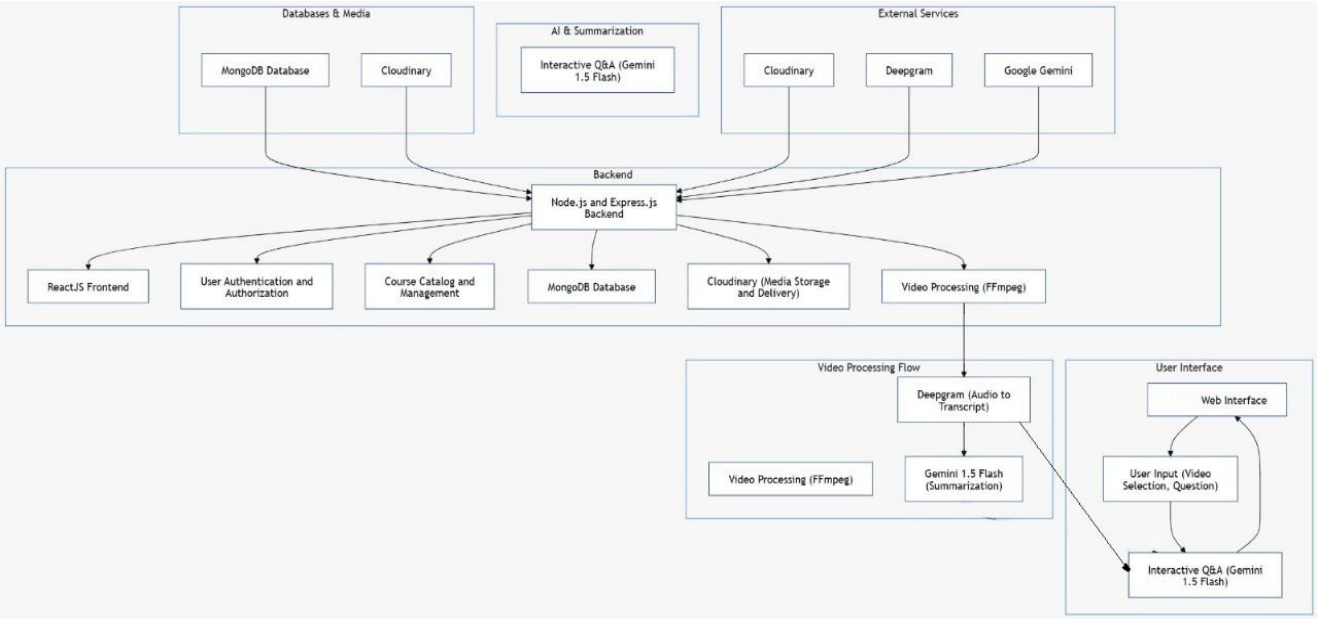

Fig 2: EduVistaAI System Architecture Diagram

Technical Architecture and AI Integration

The back-end design of EduVistaAI utilizes a monolithic architecture, ensuring a unified system for managing all features and functionalities. This architecture is robust enough to handle the complexities of an educational platform while providing inherent scalability as the user base expands. A critical aspect of the back-end is the comprehensive user authentication and authorization system, which includes secure login features, role-based access control, and OTP verification for registration, ensuring only authorized users access the system with appropriate permissions.

For efficient media management, the platform integrates with Cloudinary. This service allows instructors to effortlessly upload and manage various multimedia content, such as course videos, presentations, and other educational materials. Cloudinary ensures optimized storage and rapid delivery of media, which is vital for handling large volumes of educational content effectively.

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To prepare video content for subsequent processing, EduVistaAI employs FFmpeg, a powerful open-source multimedia framework. FFmpeg handles crucial tasks like video format conversion, compression, and trimming, optimizing the videos for seamless streaming and subsequent analytical processes.
For accurate transcription of audio content from video lectures, the platform leverages Deepgram, an advanced automatic speech recognition (ASR) service. Deepgram efficiently converts lecture audio into precise text transcripts, forming the fundamental basis for all subsequent AI-powered content processing.
Leveraging these meticulously generated transcripts, EduVistaAI employs Gemini 1.5 Flash for two core AI-powered features:

- Video Summarization: Gemini 1.5 Flash generates concise, context-aware, and highly relevant summaries of educational videos. This feature allows students to quickly grasp core lecture concepts and efficiently review content in their preferred language, significantly enhancing both accessibility and learning effectiveness.
- Interactive Question Answering: The model also powers an AI-driven interactive Q&A feature. This functionality enables students to ask questions directly related to the video content and receive instant, contextually relevant answers. This provides personalized academic support 24/7, effectively bridging gaps in understanding and improving engagement without the need for immediate instructor intervention.

This robust combination of secure user registration, comprehensive course management, efficient media handling, and advanced AI-powered video summarization and Q&A tools means EduVistaAI offers a comprehensive and highly effective digital learning platform. By addressing both the educational and technological needs of Pune's educational institutions, the platform provides an inclusive, personalized, and user-centric learning environment well-suited to the demands of modern education.

RESULTS AND DISCUSSION

The implementation of EduVistaAI demonstrated substantial success in transforming the digital learning experience for students and instructors. The platform's user interface was developed with clarity and simplicity in mind, enabling seamless navigation across courses, progress tracking, and access to academic resources. Feedback from early users highlighted that the intuitive layout helped them interact more effectively with the system and remain focused on learning objectives [17].
One of the most impactful features was the concise video summarization tool. This capability allowed students to quickly understand core lecture content without having to watch entire videos repeatedly. The video content was processed using FFmpeg to extract audio, transcribed using Deepgram, and then summarized using Gemini 1.5 Flash. This multi-step pipeline ensured that the summaries were accurate, brief, and contextually relevant. Students especially valued this feature during exam preparations and topic revisions, as it enabled efficient review of key concepts [18].
Another highly appreciated component was the interactive Q&A system, which empowered students to ask topic-specific questions based on the summarized video content. Responses were generated using Gemini 1.5 Flash, ensuring intelligent, context-aware answers that helped learners clarify doubts immediately. This feature enhanced engagement and supported self-directed learning by simulating a responsive academic assistant during the learning process.
In addition, the platform provided structured access to trustworthy educational resources, assignments, and intelligent content suggestions based on user behavior. These tools contributed to a more adaptive and supportive learning environment, helping learners stay aligned with academic goals and improve their performance [19].
Overall, the combination of interactive Q&A, concise video summarization, and intelligent content delivery tools significantly improved user engagement and learning outcomes. EduVistaAI successfully bridged the gap between traditional LMS platforms and AI-powered educational assistance, offering a practical and efficient solution for modern institutions [20].

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modern digital education. We also extend our appreciation to the developers of FFmpeg, Deepgram, Cloudinary, and Gemini 1.5 Flash for providing the advanced tools and technologies that made the sophisticated features of EduVistaAI possible. This research was made possible through the collaborative efforts of numerous individuals, and we are deeply thankful for their contributions.

CONCLUSION

EduVistaAI has successfully enhanced the digital learning experience by integrating advanced tools like FFmpeg for audio extraction, Deepgram for transcription, and Gemini 1.5 Flash for generating concise video summaries and enabling interactive question-and-answer sessions. These AI-driven features allow students to quickly understand key concepts and get real-time support without relying on traditional long-form lectures or scheduled sessions. The platform's structured course management, intuitive interface, and intelligent content suggestions contribute to a more efficient, engaging, and accessible learning environment. Going forward, EduVistaAI aims to incorporate AI-powered adaptive assessments, integrate with external educational tools, and launch a mobile application to further personalize and expand access to quality education.

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