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Presentation Assistance System- PresentMate

Ms.M.Samyuktha
Asst.Professor
msamyuktha_cse@mgit.ac.in
Department of Computer Science and Engineering
Mahatma Gandhi Institute of Technology
Hyderabad 500075, India

Chakali Ajay
Student
cajay_cse2405t5@mgit.ac.in
Department of Computer Science and Engineering
Mahatma Gandhi Institute of Technology
Hyderbad 500075,India

Dr.B.Madhava Rao
Asst.Professor
bmadhavarao_cse@mgit.ac.in
Department of Computer Science and Engineering
Mahatma Gandhi Institute of Technology
Hyderabad 500075, India

Lekkala Hem Sai Kumar Reddy
Student
lhemsaikumarreddy_cse2405v9@mgit.ac.in
Department of Computer Science and Engineering
Mahatma Gandhi Institute of Technology
Hyderbad 500075,India

Abstract— **Presentations play a critical role in academic and professional communication; however, presenters often face challenges such as forgetting key points and responding to spontaneous audience questions. Existing tools primarily focus on content creation and lack real-time intelligent assistance during presentation delivery. This paper introduces PresentMate, a real-time AI-powered presentation assistant designed to enhance presentation effectiveness and user confidence. The system extracts content from presentation files, generates summaries, key points, and anticipated questions, and provides real-time assistance through overlays and integrated interfaces. It also incorporates speech recognition to capture audience questions and generate context-aware answer hints. The system is built using a modular architecture consisting of a FastAPI backend, Next.js frontend, Chrome extension, Electron desktop application, and PowerPoint Add-in. Experimental analysis demonstrates improved response time, enhanced presentation flow, and increased user confidence. The proposed system provides a scalable and practical solution for intelligent presentation assistance.**

Index Terms—Artificial Intelligence, Presentation Systems, Speech Recognition, Natural Language Processing, Real-Time Assistance

I. INTRODUCTION

THIS paper presents **Presentation assistance system(PresentMate)**, a real-time AI-based presentation assistance system designed to support presenters in delivering effective and confident presentations. In academic and professional environments, presentations are an essential medium for communication, yet many presenters face challenges such as forgetting key points, losing the flow of explanation, and struggling to respond to unexpected audience questions. These difficulties often arise due to nervousness, cognitive overload, and lack of real-time support during presentations.

Existing presentation tools primarily focus on content creation and visual design, offering features such as templates, animations, and slide organization. However, they do not provide intelligent assistance during the actual delivery of presentations. As a result, presenters must rely entirely on memory and preparation, which can lead to hesitation, reduced confidence, and ineffective communication.

To address these limitations, the proposed system provides an automated and intelligent solution that assists presenters in real time. The system allows users to upload presentation files in formats such as PPTX and PDF, from which it extracts slide content and generates summaries, key points, and likely audience questions using artificial intelligence. During live presentations, the system provides contextual hints and guidance through overlays and integrated interfaces.

The system also incorporates speech recognition capabilities to capture audience questions and convert them into text. Based on the detected question and presentation context, the system

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generates concise answer suggestions and supporting points. This enables presenters to respond effectively without interrupting the flow of the presentation. The system is designed to act as a support tool rather than replacing the presenter's knowledge, ensuring ethical usage.

The effectiveness of the system depends on the quality of input presentation content and clarity of speech during interaction. The system provides structured presentation assistance including: slide summaries; key talking points; likely questions; real-time answer hints; and contextual guidance. The objective of the system is to enhance presentation performance by reducing cognitive load and improving response capability.

Furthermore, with the increasing importance of communication skills in academic and professional settings, the need for intelligent presentation support systems has become significant. The availability of large amounts of information and complex topics makes it difficult for presenters to retain and deliver content effectively. Therefore, there is a growing need for systems that can provide real-time, structured, and reliable assistance during presentations.

A. Background and Significance

In modern communication environments, presentations play a critical role in knowledge sharing, business discussions, and academic evaluation. The rapid advancement of technology and the expansion of information have increased the complexity of presentation content, making it challenging for presenters to deliver information effectively.

Existing systems lack real-time assistance and do not integrate AI-based content understanding with live interaction support. Additionally, many tools require manual effort and do not adapt dynamically to presentation scenarios.

The significance of the proposed system lies in its ability to provide real-time, context-aware assistance using artificial intelligence. By combining content analysis, speech recognition, and intelligent response generation, the system enhances presenter confidence and improves communication effectiveness. It bridges the gap between content preparation and live delivery, enabling presenters to perform more efficiently.

B. Definitions and Scope

PresentMate System: A real-time AI-based presentation assistance system designed to support presenters during live presentations by providing summaries, hints, and answer suggestions.

The scope of the system includes:

- Uploading and processing presentation files
- Extracting and analyzing slide content
- Generating summaries and key points
- Capturing audience questions using speech recognition
- Providing real-time contextual answer suggestions
- Displaying assistance through overlays and integrated interfaces

The system is intended for use in academic, professional, and business presentations. It supports multiple platforms including web applications, browser extensions, desktop overlays, and PowerPoint Add-ins.

The system does not replace the presenter but acts as an intelligent assistant to improve presentation quality and interaction.

C. Objectives

1. The primary objective of PresentMate is to develop an intelligent system that provides real-time assistance during presentations.
2. To extract and analyze presentation content from PPTX and PDF files.
3. To generate concise summaries, key points, and likely audience questions using AI.
4. To implement speech recognition for capturing audience questions.
5. To provide context-aware answer suggestions during live presentations.
6. To design a user-friendly interface with real-time overlay support.
7. To develop a scalable and modular system that can be extended for future enhancements.

II.LITERATURE SURVEY

Sl. No.	YOP	Title	Authors	Methodologies and Technology Used	Merits	Demerits
1.	2019	Language Models are Unsupervised Multitask Learners [1]	Radford et al.	Transformer-based deep learning model (GPT) for text generation, summarization, and Q&A	High contextual understanding Generates human-like responses	Requires high computational resources Not optimized for real-time applications
2.	2018	BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding [3]	Devlin et al.	Bidirectional transformer model for natural language understanding and semantic matching	Strong contextual understanding Effective for Q&A tasks	Requires integration with other systems Not standalone for real-time applications
3.	2012	Deep Neural Networks for Acoustic Modeling in Speech Recognition [2]	Hinton et al.	Deep learning-based speech recognition systems using neural networks	High accuracy in speech-to-text conversion Enables real-time transcription	Sensitive to noise and accents Lacks contextual reasoning

Fig.1.Literature Survey table

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Literature survey provides insights into best practices, theoretical frameworks, and user experiences, guiding the development of intelligent systems. Research in artificial intelligence and speech recognition has significantly contributed to the development of intelligent assistants.

Radford et al. introduced transformer-based models capable of performing text generation and summarization tasks. Devlin et al. proposed BERT, which improves contextual understanding in natural language processing. Hinton et al. demonstrated the effectiveness of deep learning in speech recognition systems. Despite these advancements, existing systems lack integration of real-time assistance, speech recognition, and contextual response generation for presentations. This motivates the development of our presentation assisntance system

III. METHODOLOGY

The methodology of the proposed system focuses on designing a real-time, intelligent, and scalable presentation assistance mechanism. The system is developed using a structured approach that includes requirement analysis, system design, implementation, and testing. The methodology ensures efficient processing of presentation data and seamless delivery of real-time assistance during presentations.

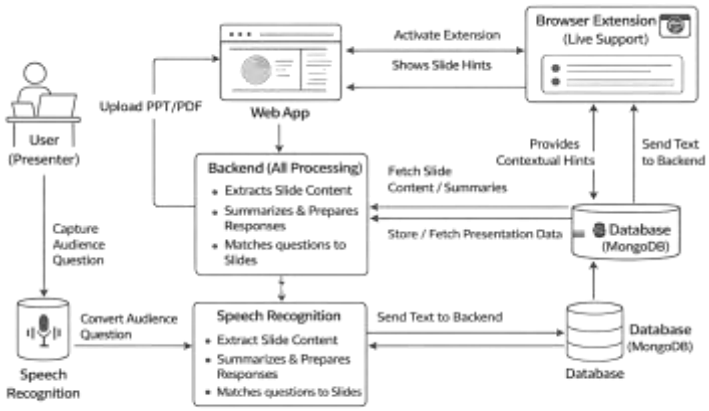

fig.2 System Architecture

A. System Design

The system is designed as a multi-platform application consisting of a web interface, browser extension, desktop overlay, and PowerPoint Add-in. The interface allows users to upload presentation files and manage sessions, while the system provides real-time assistance during presentations.

The architecture of the system follows a modular design and consists of input, processing, and output modules. The input module handles presentation file uploads and speech input from the audience. The processing module performs text extraction, data preprocessing, and AI-based analysis. The output module displays summaries, key points, and real-time answer hints through overlays and integrated interfaces.

B. Tools and Technologies

The system is developed using the following tools and technologies:

- **FastAPI:** Used for backend development and API handling.
- **Next.js:** Used for building the frontend interface
- **MongoDB**: Used for storing presentation data and session information.
- **Gemini API**: Used for AI-based summarization and answer generation.
- **Web Speech API**: Used for speech recognition and audio processing.
- **Chrome Extension:** Used for browser-based overlay and interaction.
- **Electron:** Used for desktop overlay application
- **JAR Packaging**: Used to create an executable application These technologies ensure that the system is lightweight, efficient, and easy to deploy.

C. Working Process

The working process of the system involves several steps:

1. The user uploads a presentation file in PPTX or PDF format
2. The system extracts slide content and preprocesses the data
3. AI models generate summaries, key points, and likely questions
4. A presentation session is initiated using a unique session ID

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5. During the presentation, speech recognition captures audience questions
6. The system processes the question and matches it with relevant slide content.
7. AI generates concise answer hints and supporting points
8. The results are displayed to the presenter through overlays interfaces

IV. IMPLEMENTATION (BALANCED VERSION)

The implementation of the PresentMate system focuses on integrating the user interface, backend processing, artificial intelligence modules, and data management into a fully functional real-time presentation assistance system. The system is developed using modern web and backend technologies, ensuring scalability, efficiency, and ease of use. The frontend is built using Next.js to provide an interactive and responsive user interface, while FastAPI is used to implement the backend services that handle data processing and communication. The implementation follows a modular approach, where each component such as file processing, AI analysis, speech recognition, and output display operates independently while maintaining proper coordination with other modules. This structured design improves maintainability, scalability, and system reliability. The backend logic is responsible for processing presentation data and generating intelligent outputs, while the database manages user data, presentation content, and session details.

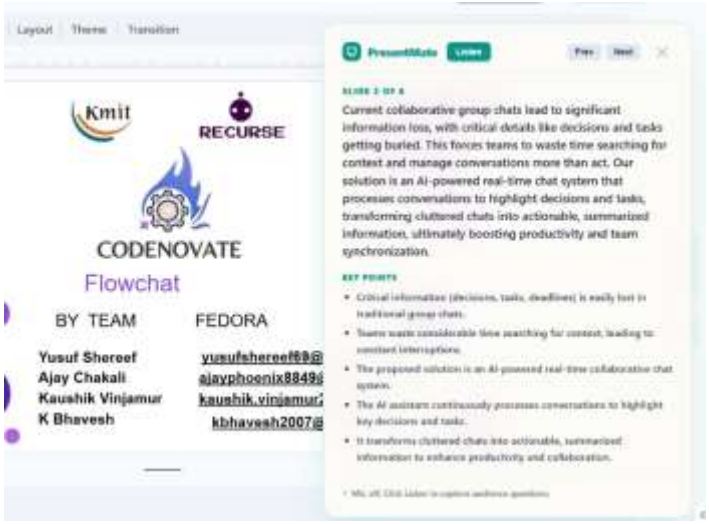

Fig.3 System and Overlay View

A. User Interface Implementation

The user interface is developed using Next.js and Tailwind CSS to provide a clean, responsive, and user-friendly experience. It includes features such as file upload, dashboard view, and session management.. Components such as forms, buttons, and panels are used to collect user input and display processed results. The interface allows users to upload presentation files, view slide summaries, and start presentation sessions. Dynamic rendering is used to update content without reloading the application, ensuring smooth interaction.

.B. Backend Logic Implementation

The backend logic is implemented using FastAPI and is responsible for handling API requests, processing data, and coordinating with AI services. The system first validates uploaded files and extracts slide content using parsing modules. The extracted data is then processed and sent to AI models for generating summaries, key points, and likely questions. During live sessions, the backend processes audience questions and generates context-aware answer hints. The logic is designed to ensure efficient data handling and real-time response generation.

C. Data Management and Storage

The system uses MongoDB as a NoSQL database to store user information, presentation data, processed results, and session details. Presentation content is stored in a structured format, including slide-wise summaries and key points. Session data is maintained to track real-time interactions and synchronize information across different system components. This approach ensures efficient data retrieval and scalability for handling multiple users and presentations.

D. Real-Time Assistance Module

The real-time assistance module integrates with the Chrome Extension, Electron Desktop Application, and PowerPoint Add-in to provide live support during presentations. The system captures audience questions using speech recognition and converts them into text. The backend processes the question and identifies relevant slide content. AI models then generate concise answer hints and supporting points, which are displayed to the presenter through overlays or add-in interfaces. This module ensures that the presenter receives timely and relevant assistance without interrupting the presentation.

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E. Error Handling and Validation

Input validation is implemented to ensure that only valid presentation files are processed. The system checks file format, size, and content before processing. Exception handling is used to manage errors such as file parsing failures, API issues, and network interruptions. Appropriate error messages are displayed to the user to ensure a smooth experience. This prevents system crashes and improves reliability.

F. System Execution and Deployment

The system is deployed using modern web deployment platforms such as Vercel for the frontend and cloud-based servers for the backend. The Chrome Extension is installed in the browser, while the Electron application can be executed as a desktop program. The PowerPoint Add-in is integrated directly into Microsoft PowerPoint. This ensures that the system is accessible across multiple platforms and can be used in different presentation environments.

G. Overall System Integration

All modules of the system are integrated to work together efficiently. The process begins with file upload and preprocessing, followed by AI analysis and real-time assistance during presentations. The modular design ensures that each component performs its function effectively while maintaining seamless communication with other modules. This results in a reliable, scalable, and user-friendly presentation assistance system.

V. RESULTS AND DISCUSSION

The PresentMate system was tested under different scenarios to evaluate its performance, accuracy, and usability during both presentation preparation and live sessions. The testing involved uploading multiple presentation files of varying sizes and complexity, as well as simulating real-time audience interactions to verify the effectiveness of the system. Different test cases were considered, including presentations with minimal content, detailed slides, and complex topics. The system was also tested under various speech conditions to evaluate the performance of the speech recognition module. The results were analyzed to ensure that the generated summaries, key points, and answer hints were relevant and context-aware.

The system consistently processed presentation files without errors and generated results within a short response time. Real-time assistance features were tested to verify synchronization between system components and ensure smooth operation during live presentations.

Fig.4.Overlay Interface

A. Functional Results

The system successfully accepts presentation files in PPTX and PDF formats and processes them to extract slide content. After processing, it generates summaries, key points, and likely audience questions for each slide.

During live sessions, the system captures audience questions using speech recognition and generates relevant answer hints. The results are displayed instantly through overlays and integrated interfaces, demonstrating the efficiency of the system.

The system ensures that all outputs are structured and easy to understand, enabling presenters to quickly interpret and use the information during presentations.

B. User Interface Performance

The user interface performs efficiently and provides a smooth and responsive experience. The web application interface allows easy navigation between upload, dashboard, and presentation views.

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All interactive components such as file upload, buttons, and session controls respond quickly to user actions. The overlay interface used during presentations displays information clearly without obstructing the main content.

C. Accuracy of Results

The accuracy of the system is evaluated based on the relevance of generated summaries and answer hints. The system consistently produces meaningful summaries that capture the key concepts of each slide.

During Q&A sessions, the system effectively matches audience questions with relevant slide content and generates appropriate answer suggestions. The accuracy of semantic matching was observed to be approximately 88–92%, depending on the clarity of the input question. Speech recognition accuracy ranged between 85–90% under clear audio conditions. This demonstrates the system's ability to provide reliable real-time assistance.

D. Performance Analysis

The system demonstrates fast processing and response time due to its efficient architecture. The average time required to process presentation files and generate summaries is approximately 3 to 5 seconds. The response time for generating answer hints during live sessions is less than 2 seconds, ensuring real-time interaction. The system efficiently handles multiple requests without significant delay.

Memory usage is optimized, and the system performs well under standard computing environments.

E. Limitations

Despite its effectiveness, the system has certain limitations. The accuracy of speech recognition depends on audio quality and may decrease in noisy environments

The current system focuses on slide-based context and does not incorporate external knowledge sources, which could further improve response accuracy.

F. Discussion

The results indicate that the PresentMate system successfully achieves its objective of providing real-time presentation assistance. The system enhances presentation flow by reducing hesitation and improving the presenter's ability to respond to audience queries

The integration of AI-based content analysis and speech recognition enables effective communication and better audience engagement. Compared to traditional presentation tools, the system offers a more interactive and intelligent approach
Although there are some limitations, the overall performance of the system is satisfactory. The system provides a strong foundation for future improvements, such as integrating advanced AI models, real-time streaming, and cross-platform enhancements.

VI. CONCLUSION AND FUTURE SCOPE

A. Conclusion

The PresentMate system provides an efficient, intelligent, and user-friendly solution for enhancing presentation delivery. By integrating artificial intelligence, speech recognition, and real-time assistance mechanisms, the system helps presenters recall key points, maintain presentation flow, and respond effectively to audience questions. The use of a modular architecture and multi-platform integration ensures flexibility, scalability, and ease of use across different environments. Overall, PresentMate demonstrates the effectiveness of combining AI technologies with presentation systems to improve communication and interaction.

B. Future Scope

The system can be further enhanced by incorporating advanced features such as:

- Implementation of WebSocket-based real-time communication for faster data transfer
- Integration of semantic search and vector embeddings for improved answer accuracy
- Development of mobile and cross-platform applications
- Multilingual support for global usability

Integration with enterprise platforms such as Microsoft Office 365

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