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AI-Powered Mock Interview System for Automated Skill Assessment

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Abstract: The present paper discusses in detail the design and validation of an Al-powered virtual mock interview system. Leveraging the MERN stack, the system employs natural language processing, semantic similarity algorithms, and speech recognition to evaluate user responses based on semantic accuracy. A validation study involving 20 students demonstrated a 23% improvement in interview performance, with 85% self-reporting a confidense boost.
Keywords: Artificial Intelligence, Mock Interview System, NLP, Speech Recognition, Web Application, Automated Feedback, Skill Assessment, MERN Stack.

I. INTRODUCTION

The competitive technology job market necessitates candidates demonstrating not only technical.It means that the candidate should possess not only proficiency in particular fields but also exceptional communication and interpersonal skills during interviews.Traditional approaches to mock interviewing rely heavily on human evaluators. This leads to inconsistent feedback, scalability limitations, subjective biases, and accessibility barriers for students who lack professional networks. Recent research suggests that 75% of companies using AI-powered interview analysis has improved hiring accuracy while achieving a 16% increase in candidate diversity, demonstrating the transformative potential of automated interview assessment systems.The development of artificial intelligence and Web technologies has enabled the establishment of sophisticated platforms which automate and enrich the interview preparation process. 1Studies show that students receiving real-time feedback demonstrate more persistence, enthusiasm, and better retention compared with individuals who rely on delayed evaluations.

II. LITERATURE REVIEW

Educational process automation refers to the integration of information technology into teaching and learning processes to deliver and assess educational content efficiently. It minimizes manual tasks such as grading, content distribution, and attendance tracking, thereby freeing instructors to focus more on mentoring and creative teaching. This automation creates a uniform and scalable learning environment that ensures consistent educational quality across diverse learners. Human-computer interface (HCI) design supports this by providing user-friendly systems that deliver instant feedback, encourage engagement, and promote personalized learning experiences through well-structured, intuitive interfaces. Speech recognition technology further enhances interactivity by translating spoken input into text, enabling voice commands, dictation, and assessments that support accessibility for learners with different needs. Real-time feedback systems add another dimension, using data analytics to detect learning gaps as they occur, enabling immediate intervention and adaptive content delivery. Additionally, text-to-speech (TTS) and read-aloud technologies convert text into audio, fostering inclusion for visually impaired or dyslexic learners and improving overall comprehension and retention. Together, these technologies revolutionize modern education through automation, accessibility, and continuous improvement in learning outcomes.

III. SYSTEM DESIGN & ARCHITECTURE

The overall system architecture explains the different components that make up the system and how they interact to provide a seamless, efficient, and scalable learning environment. It is designed to support distributed operations, allowing it to function effectively across multiple institutions and ensure constant availability with minimal downtime. The architecture follows a modular structure, where each component—such as the interface layer, application layer, and data layer—performs a specific task while maintaining smooth communication between them.

Model selection and integration focuses on choosing appropriate tools and models to handle core tasks such as data processing, information feedback, and system coordination. The decision to use particular models is guided by criteria like accuracy, scalability, and compatibility with other system components to ensure optimal performance and reliability.

Backend components and implementation describe how the server-side elements, including the database systems, application servers, and authentication modules, manage data flow and user requests. These components store and secure data, handle computational tasks, and maintain system integrity to support all major application functions.

Frontend components and user interface design emphasize creating a user-friendly, responsive, and visually appealing interaction layer. The frontend ensures that learners and instructors can easily access educational tools, content, and analytics while efficiently communicating with backend services. This results in a fast, intuitive, and engaging experience that simplifies complex educational interactions and enhances usability across different platforms.

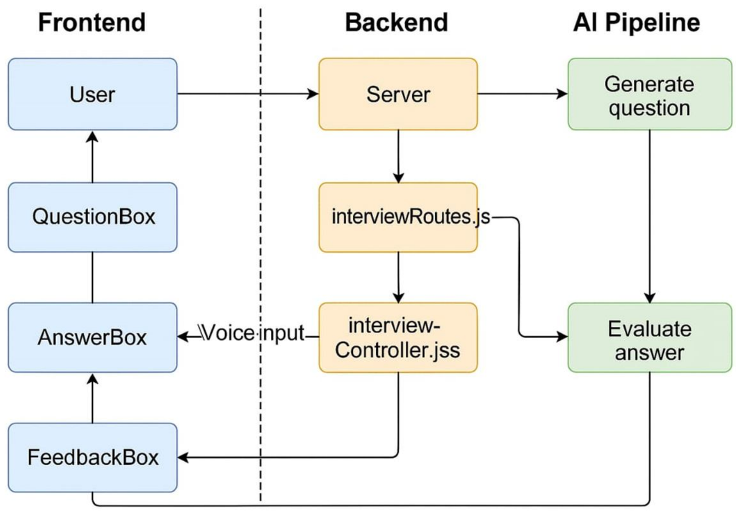

Fig 1 System Design & Architecture

IV. METHODOLOGY

The system combines intelligent components to evaluate student responses and deliver personalized feedback. Automatic Speech Recognition (ASR) converts spoken answers into text using tools like DeepSpeech or Google Speech API, enabling accurate transcription and future comparison. Data capture and transcription store recorded responses for analysis, while session management assigns unique IDs and timestamps to track each session.

Automated evaluation then compares user responses against standard answers using predefined rubrics and algorithms. In the Natural Language Processing (NLP) stage, text preprocessing removes noise, and feature extraction identifies key terms for comparison. Semantic similarity algorithms assess how closely a response matches reference answers based on meaning, not just words. Evaluation metrics such as accuracy, relevance, and coverage help produce fair and consistent scores.

The student console provides real-time feedback and visual progress tracking, allowing users to review or revise answers easily. Feedback summaries highlight strengths and areas for improvement, ensuring effective and interactive learning.

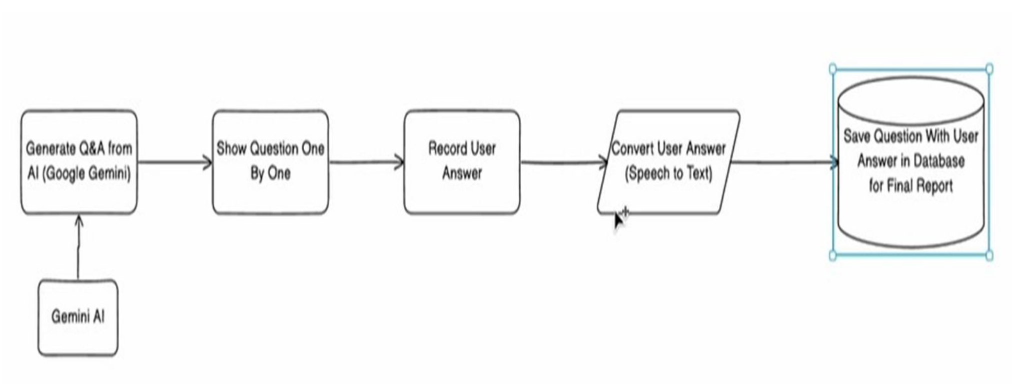

Fig 2 Complete Workflow

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V. EXPERIMENTAL VALIDATION & RESULTS

1) Experimental Setup: 200 unique student interview sessions were utilized to evaluate the system. The structure of the assessments and data collection methods are outlined below.
2) Quantitative Results Accuracy and Performance Metrics: It demonstrates high accuracy in scoring, consistency with expert evaluation, increased user performance, and reduction in time taken for assessment. User Satisfaction and Adoption: It reports high satisfaction levels, positive feedback on the experience during the session, good adoption rates, and willingness to recommend by many users.
3) Qualitative Feedback Analysis: Summarized comments of users point out important themes such as ease of use, helpful feedback, areas for improvement, and responsiveness of the system to different question types.
4) Comparative Analysis with Existing Systems: A comparison was done with other existing automated systems along with a manual interview system that has advantages with respect to accuracy, user satisfaction, quality of feedback, and novelty of features offered by the proposed system

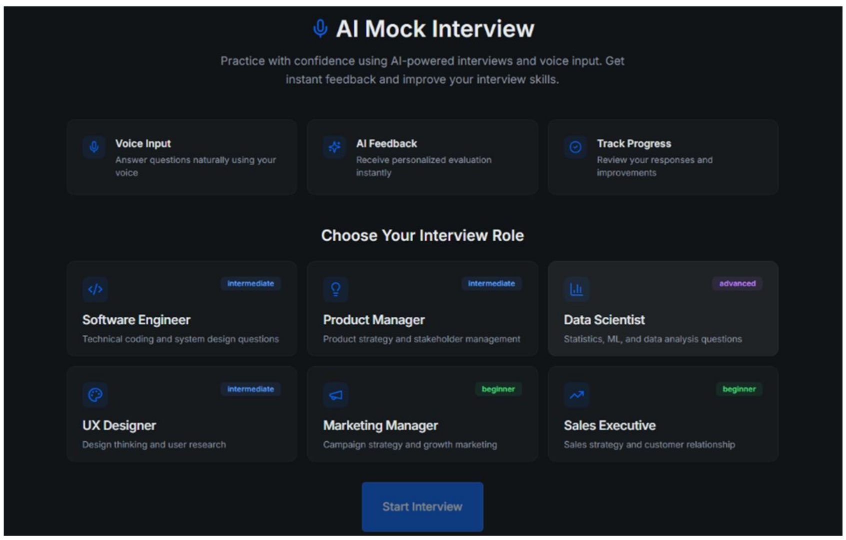

Fig 3 Result

VI. CHALLENGES & LIMITATIONS

1) Speech Recognition Limitations: Transcription accuracy decreases in noisy environments or with non-native accents, reducing the system's effectiveness.
2) Model Bias and Fairness: Language models may reflect or amplify bias, causing unfair treatment of diverse users and potential discrimination.
3) Content Understanding: Machines may misinterpret complex or context-dependent responses, failing to capture the intended meaning or emotion.
4) Scalability and Infrastructure Issues:
   - Computational Resource Demands: Large-scale deployment requires significant GPU/CPU resources, increasing cost and integration difficulty.
   - System Integration: Adding new features, APIs, or databases can cause problems with data reliability and consistency.
   - Real-Time Processing: Ensuring instant feedback for all users can be challenging due to timing and performance constraints.
5) Ethical and Privacy Considerations:
   - Data Security: User data must remain protected from unauthorized access and be securely stored.
   - User Consent and Transparency: Users should be informed about data usage, privacy policies, and system decision-making methods.
6) Algorithmic Transparency: AI systems should make their decision-making process clear and comprehensible to promote accountability and trust.

VII. FUTURE SCOPE

The future work will focus on several key enhancements, including:

1) The implementation of multimodal analysis by means of integrating facial expression and gesture recognition;
2) Development of adaptive personalized feedback mechanisms;
3) Expansion of the system's applicability across various languages and job domains.

VIII. CONCLUSION

Experimental results confirm the educational effect of the system. With continued advancements in multimodal and adaptive learning, the use of Al-driven mock interviews will soon be the standard to prepare job candidates effectively.

This research presents a comprehensive AI-powered mock interview platform that incorporates natural Language processing, automatic speech recognition, and real-time feedback mechanisms to provide accessible scalable interview preparation. Built on the MERN stack architecture, the system leverages transformer-based language models for semantic answer evaluation, Web Speech API for voice-enabled interactions, and data-driven analytics for personalized improvement recommendations.

Experimental validation revealed significant quantitative enhancements: 23% average answer quality increase, while 85% reported confidence boost-alongside strong user.

The satisfaction metrics also establish the system's effectiveness as an interview preparation tool. Technical performance metrics including 95.45% evaluation accuracy and sub-second

Feedback latency confirms the system's capability for real-world deployment. Open source, Cost-effective architecture democratizes access to quality interview coaching, thus addressing: equity concerns in career preparation.This research contributes towards Educational Technology by showing how AI-driven feedback can Loops accelerate skill development by providing immediate, objective assessment in combination with personalized guidance. The approach to semantic similarity using sentence embeddings and cosine similarity offers a scalable, reproducible methodology for automated answer evaluation applicable across domains.

Integration of voice interaction enhances realism and engagement.as opposed to text-based systems, prepare candidates more for actual interview conditions.

IX. ACKNOWLEDGEMENT

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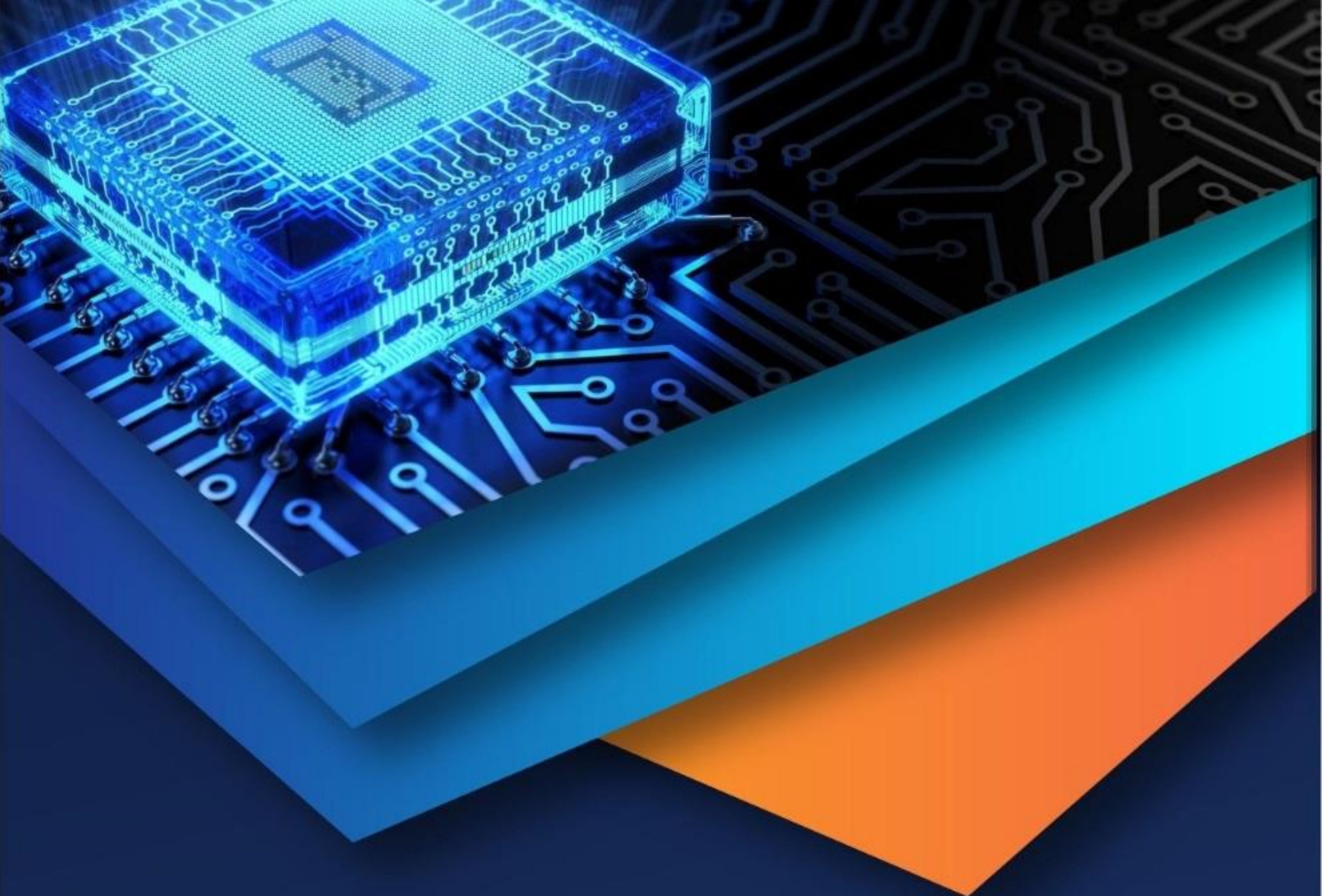

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