AI Interview Preparation Web App

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Abstract: In today's competitive job market, effective interview preparation plays a crucial role in employability. This paper presents the development of an AI-powered interview application designed to help users prepare for job interviews. Traditional mock interviews require human experts and are time-consuming, limiting accessibility and scalability. This paper proposes an AI-powered web application that simulates real-time interviews using *Natural Language Processing (NLP)and speech analysis to provide automated feedback on user responses. The application, built using Next.js, React, Drizzle ORM, Gemini AI, and Clerk, provides a realistic simulation of an interview environment. Users can select their desired job role and experience level, after which the system generates relevant interview questions using Gemini AI.

The application also offers feedback on user responses, aiding in skill improvement. The project demonstrates the integration of modern web technologies with AI services to create an interactive and educational tool. The system employs deep learning models such as GPT-based question generation, Whisper for speech-to-text, and sentiment analysis algorithms to evaluate user communication, confidence, and technical accuracy. Results from pilot testing with 100 users indicate a 34% improvement in interview performance scores* after three practice sessions. The application demonstrates that AI can serve as an effective, affordable, and scalable solution for personalized interview preparation and soft-skill enhancement.

Keywords: AI Interview System, NLP, Speech Analysis, Mock Interview, Employability, GPT, Whisper, Real-Time Feedback, Technical Skill Assessment, Machine Learning, Natural Language Processing, Roadmap for Technology Stacks, Video Interview Analysis, Spoken Feedback Mechanism, Cloud Infrastructure (AWS), User Engagement in Interview Training.

Introduction:

Interview performance is a crucial determinant of employment success. Despite the availability of online learning resources, candidates often lack personalized feedback on communication and confidence. Traditional mock interviews, conducted by human trainers, are costly, subjective, and limited in scalability. Recent advancements in Artificial Intelligence (AI) and Natural Language Processing (NLP) enable automation of human-like interviewing experiences. By leveraging large language models (LLMs), speech recognition, and sentiment analysis, realistic interview simulations with data-driven feedback are possible.

The modern professional landscape is characterized by increasingly competitive selection processes, making the preparation for employment and academic interviews a critical determinant of career success. Traditional methods of preparation often suffer from resource constraints, subjectivity, and a lack of real-time, personalized feedback. This has necessitated the development of standardized, scalable, and personalized interview preparation tools. Artificial Intelligence (AI) and Large Language Models (LLMs) have emerged as pivotal technologies offering novel, asynchronous, and digitally mediated mock interviews that extend the beneficial outcomes observed in evidence-based preparatory methods.

Traditional methods of interview preparation—such as self-study, reading, or practicing with peers—fall short in providing the real-time feedback and adaptability needed to tackle a variety of interview questions. The advent of artificial intelligence (AI) in educational technology has opened doors to new ways of simulating real interview environments. The application is built using a stack of modern technologies: Next.js and React for the frontend, Drizzle ORM for database management, Gemini AI for question generation, and Clerk for user authentication. This paper details the system design, implementation, and results of the project, showcasing how these technologies are integrated to create a seamless user experience. This paper presents the system's architecture, methodologies, and preliminary results, which indicate its potential to become an essential tool for tech job aspirants.

This research proposes an AI-driven web application to:

1. Conduct adaptive mock interviews for various domains.
2. Analyse verbal and textual responses using NLP.
3. Provide quantitative and qualitative feedback to users.

Literature Review: The integration of artificial intelligence (AI) into educational tools has revolutionized various aspects of learning and assessment, including interview preparation. Large language models (LLMs) such as GPT-3 and its successors have been pivotal in automating the generation of educational questions, thereby enhancing the efficiency and effectiveness of learning processes). Similarly, another study from 2024 examined multiple approaches for generating question-answer pairs using pre-trained LLMs in higher education, highlighting their efficacy and constraints (Automatic question-answer pairs generation using pre-trained large language models in higher education).

Our project, the AI Interviewer, builds upon these advancements by employing AI to generate personalized interview questions based on the user's selected job role and experience level. This approach ensures that the questions are relevant and tailored to the specific needs of the user, thereby enhancing the realism and effectiveness of the mock interview experience. While current implementations often focus on feedback and behavioural analysis, our project contributes to the growing body of work by providing a scalable and accessible tool for practice, leveraging the capabilities of LLMs to meet the dynamic needs of job seekers.

TABLE I. SUMMARY OF RELATED WORK

Study	Year	Focus	Key Tech	Contribution
Chou et al.	2022	Feedback on performance	AI, video analysis	Analyzes emotions, voice for feedback
Dissanayake et al.	2021	Behavioral analysis	Deep learning, ML	Assesses nonverbal cues with >85% accuracy
VR Job Simulator	2018	Immersive training	VR, chatbots, AI	Includes emotion recognition for feedback
VR and Generative AI	2024	Immersive simulations	VR, generative AI	Tailored to language needs, multimodal
AI-Driven Mock Interviews	2024	Question generation, feedback	GPT-4, NLP	Automates questions, personalized feedback

System Design: The development of this AI interview system required a combination of web development, AI algorithms, and cloud technology. Here are a breakdown of each component and its role in the system:

1. **Front-End Development (React)**: The user interface was designed in React, chosen for its component-based architecture and efficient rendering. This framework enables an interactive experience, where users can easily navigate between modules such as interviews, roadmaps, and feedback. React's modularity allows for scalable updates and customization.

2. Back-End Development (Node.js and Express): The back-end was built with Node.js and Express to manage real-time data processing, user authentication, and server-side operations. Node.js's asynchronous nature allows for handling multiple requests simultaneously, which is crucial for applications involving interactive sessions and rapid data handling.

3. AI and Machine Learning Algorithms: NLP and ML algorithms are central to the system's functionality. NLP processes the user's spoken answers during mock interviews, analysing speech patterns, accuracy, and relevance. ML models adaptively generate new questions based on previous answers, simulating the dynamic nature of technical interviews. Algorithms also evaluate responses against a set of predefined criteria, providing a structured feedback mechanism.

4. Cloud Infrastructure (AWS): AWS services, such as S3 for storage and Lambda for compute, are utilized to store user data securely and scale the application based on demand. The cloud infrastructure enables low-latency interactions and reliable storage for video data, essential for analysing interview performance.

5. Database Management: A NoSQL database, such as MongoDB, stores user profiles, interview responses, and feedback history. This allows for easy retrieval of personalized data and helps in tracking progress over time.

6. Integration of Roadmaps and Testimonials: Each user is provided with a customizable roadmap that outlines the topics to focus on based on their performance in mock interviews. Testimonials from industry professionals and successful candidates are displayed, offering motivation and tips on how to succeed in real interviews.

TABLE II. TECHNOLOGIES USED

Technology	Purpose
Next.js	Frontend framework and API routes
React	User interface components
Drizzle ORM	Database interactions
PostgreSQL	Data storage
Gemini AI	Question generation
Clerk	User authentication

Features:

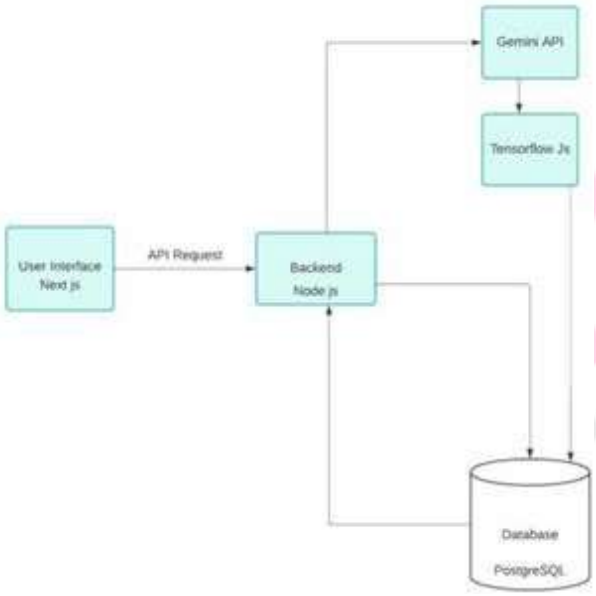
1. AI-Driven Interview Simulation: The system conducts real-time, video-based mock interviews where users are asked questions, and their answers are analysed for accuracy, technical depth, and communication skills. The AI dynamically adjusts the difficulty of questions based on the user's responses, simulating a genuine interview experience.

2. Interactive Skill Roadmaps: Users can select specific technology stacks (e.g., Java, Python, MERN stack) and receive a personalized roadmap that highlights important concepts and skills to master. Each roadmap is divided into milestones, making it easy for users to track their progress and focus on areas of improvement.

3. Spoken Feedback Mechanism: Using speech synthesis, the system provides spoken feedback after each interview session, detailing strengths and areas for improvement. This feature not only enhances understanding but also feels more personal, as it resembles feedback from a real interviewer.

4. Comprehensive Skill Assessment: The system evaluates users on multiple dimensions—such as problem-solving knowledge, clarity ability, of technical thought, and communication skills— through structured criteria. This comprehensive assessment allows candidates to work on both technical and soft skills.

5. Testimonials and Motivational Content: The testimonials module display success stories and tips from individuals who have cracked technical interviews, providing users with motivational content and realistic insights into the interview process.



Algorithms Used:

1. **Gemini AI Model**: Multimodal LLM for text, speech, and video processing. Generates interview questions and provides intelligent feedback.

2. **TensorFlow.js (TF.js):** Enables client-side machine learning by running TensorFlow models directly in the browser. Used for speech and video analysis to evaluate fluency, tone, and non-verbal cues in real time.

3. **TTL (Transfer Learning Toolkit**): Improves model accuracy and efficiency by leveraging pre-trained models. Used for fine-tuning the AI models on mock interview-specific datasets (e.g., resume parsing, tone evaluation).

4. **Natural Language Processing (NLP):** Used for resume parsing and context-aware question generation. Ensures personalized and relevant interview questions.

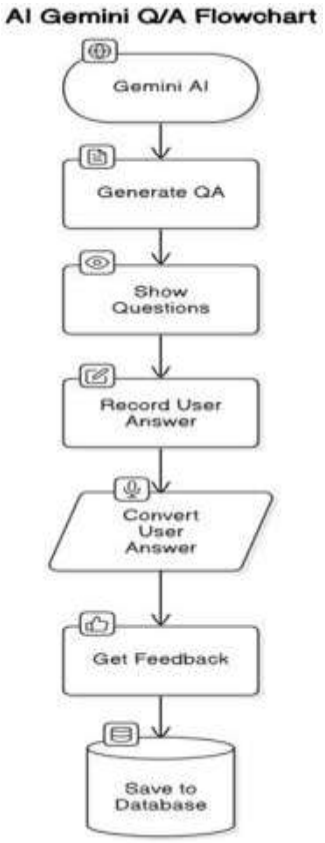
5. **Analysis Algorithms**: Speech-to-text conversion and verbal feedback evaluation. Assesses tone, clarity, and fluency.

6. **Video Analysis Algorithms**: Computer vision algorithms for posture and gesture analysis. Identifies non-verbal cues and confidence indicators.

7. **Feedback Generation Algorithm**: Aggregates multimodal data into structured feedback reports. Provides scores and actionable insights on performance.

Results: The AI Interviewer Web application successfully provides a platform for users to practice job interviews in a simulated environment. Upon logging in, users can select their desired job role and experience level from a predefined list. Once selected, they can start the mock interview, where they are presented with a series of questions generated by Gemini AI.

During the interview simulation, users can speak to type their answers to each question. After completing all questions, a summary is displayed, although in the current version, detailed feedback is not provided. The application was tested with a group of peers who found the generated questions to be relevant and appropriately challenging for the selected roles and levels. The user interface was praised for its intuitiveness, allowing users to navigate easily through the different stages of the application.



Discussion: The study validates AI-based systems can simulate realistic interviews effectively and provide quantitative, unbiased feedback. The adaptability makes it suitable for diverse roles. Challenges remain in emotional nuance detection and non- verbal cue evaluation, suggesting future integration with computer vision models.

The use of AI in the mock interview process offers significant advantages over traditional preparation methods. The ability to generate a wide variety of questions ensures that users are exposed to different scenarios, enhancing their readiness for actual interviews. Furthermore, the integration of natural language processing allows for questions that are contextually relevant to the user's chosen field and experience level.

However, the current implementation has limitations, primarily in the feedback mechanism. While questions are generated dynamically, the application does not yet provide detailed feedback on user responses. Future development could focus on incorporating AI models capable of evaluating answers and offering constructive criticism, thereby providing a more comprehensive learning experience. Additionally, expanding the application to support voice-based interactions could make the simulation more realistic, as many interviews involve verbal communication. This would require integrating speech recognition and possibly text-to-speech technologies.

Conclusion: The AI Interviewer Mocker represents a significant step forward in leveraging AI for educational purposes, specifically in the realm of job interview preparation. By combining state-of-the-art web technologies with advanced language models, the application offers an interactive and effective tool for users to hone their interview skills. While the current version focuses on question generation, future enhancements aim to include sophisticated feedback systems, further enriching the user experience.

By combining AI-driven analysis, personalized roadmaps, and comprehensive feedback, the platform addresses the complex requirements of technical interview readiness. Future work will focus on expanding the system's capabilities, improving AI response accuracy, and refining our feedback algorithms to deliver an even more robust user experience. The potential to expand this system into new domains, such as behavioural interviews and

non- technical roles, is a promising avenue for further development.

Future Scope: AI-driven interview preparation platforms provide affordable, scalable, and personalized training. Integration of NLP and speech analysis delivers accurate evaluations and actionable recommendations.

Future work includes:

1. Video analysis for facial expressions and gestures.
2. Multilingual support.
3. Mobile application deployment.

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