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AI-PrepMate: AI-Assisted Mock Interview and Feedback System

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Abstract: This paper presents AI-PrepMate: AI-Assisted Mock Interview and Feedback System, an AI-powered mock interview application designed to enhance technical interview preparation through real-time feedback and performance evaluation. Built using React, TypeScript, Firebase, and Google Gemini AI, the system enables users to log in, create mock interviews, record responses, and receive AI-generated assessments. By leveraging natural language processing (NLP) and machine learning, the platform evaluates user responses against predefined criteria, providing structured feedback to improve interview readiness. Additionally, Firebase ensures seamless data storage and authentication via Clerk, making the system scalable and secure. The application is deployed on Firebase Hosting, ensuring real-world usability. This research explores the implementation process, technical challenges, and future enhancements to optimize AI-driven interview simulations for aspiring professionals.

Keywords: Mock interview system, Natural Language Processing (NLP), Google Gemini AI, AI-driven assessment, Automated interview feedback, Firebase cloud database, Scalable web application for interview practice AI-assisted learning and evaluation**.**

I. INTRODUCTION

Technical interviews are a critical component of the hiring process, especially in the fields of software development and engineering. However, many candidates struggle with interview anxiety, lack of structured practice, and the absence of real-time feedback. To address these challenges, we present AI-PrepMate: AI-Assisted Mock Interview and Feedback System, an AI-powered mock interview system designed to help users enhance their technical interview skills through AI-driven assessments and feedback.

This system leverages Google Gemini AI to analyze user responses and provide instant, data-driven evaluations. The application is built using React and TypeScript for a dynamic frontend experience, with Firebase serving as the backend for authentication, storage, and hosting. Clerk is integrated to ensure secure user authentication, enabling personalized interview experiences. Users can create mock interviews, record their responses, and receive detailed feedback, including performance ratings, improvement suggestions, and question-specific analysis.

The aim of this research is to explore the development, implementation, and impact of AI-driven mock interview platforms in preparing job seekers for real-world technical interviews. We discuss the methodologies used in building the system, the challenges encountered during development, and the potential for future enhancements, such as integrating more advanced AI models and expanding industry-specific interview simulations. This paper contributes to the growing field of AI-assisted education and career preparation, demonstrating how machine learning and natural language processing can revolutionize interview training.

II. LITERATURE REVIEW

2.1 AI-Driven Personalized Feedback in Learning Systems

Troussas et al. (2023) [1] explored natural language processing (NLP)-based personalized feedback in intelligent tutoring systems, emphasizing how AI can adaptively enhance learning. This research aligns with our work, as our AI mock interview system leverages Google Gemini AI to provide personalized, adaptive feedback on interview responses.

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2.2 AI-Based Mock Interview and Behavioral Analysis

Kolpe et al. (2024) [2] proposed an AI-based mock interview system focused on behavioral recognition, using machine learning to evaluate candidates' body language and voice modulation. Similarly, our system integrates AI-driven textual response analysis, and future extensions could incorporate sentiment analysis and emotion detection to enhance evaluation.

2.3 Performance Evaluation in AI Mock Interviews

Chou et al. (2022) [3] developed an AI-powered mock interview platform that assesses user performance based on structured responses and feedback mechanisms. Their work highlights the importance of real-time feedback and automated scoring, similar to how Google Gemini AI processes and evaluates responses in our application.

2.4 AI in STEM Graduate Interview Preparation

Johnson (2024) [4] explored the application of AI-driven mock interviews tailored for STEM graduates, focusing on technical question evaluation and AI-driven hints. Our research extends this concept by providing structured assessments using NLP, guiding candidates through the interview preparation process.

2.5 AI-Based Performance Enhancement in Interviews

Patil et al. (2024) [5] discussed the impact of AI-driven interview coaching on performance improvement. Their study demonstrated that AI-based feedback can significantly enhance candidate preparedness, supporting our hypothesis that an AI-powered mock interview system can improve response accuracy and confidence.

2.6 Video Interview and Personality Analysis

Anand et al. (2021) [6] explored video-based personality analysis to assess candidates' communication styles. Similarly, our research envisions potential extensions where facial emotion recognition (Zhang et al., 2019) [11] and deep learning-based personality recognition (Suen et al., 2019) [10] could enhance interview evaluation.

2.7 Deep Learning for Interview Coaching and Action Selection

Su et al. (2016) [7] examined dialog state tracking and action selection in AI-driven interview coaching, demonstrating how deep learning can guide users through structured responses. Our project builds on this by integrating real-time AI feedback using NLP, allowing for dynamic and adaptive learning.

2.8 Structured vs. Unstructured Interviews in AI Systems

Campion et al. (1997) [8] provided a comprehensive review of structured interview methods, emphasizing their reliability over unstructured formats. Our system incorporates this principle by generating structured AI-driven questions and evaluations, ensuring consistency in feedback.

2.9 AI-Based Interview Critique and Sentiment Analysis

Nirgide et al. (2024) [9] introduced an AI-based interview critique system utilizing deep learning to provide detailed feedback. This aligns with our approach, where AI validates responses, assigns performance scores, and provides improvement suggestions. Additionally, Batbaatar et al. (2019) [13] demonstrated emotion recognition from text, which could be a future enhancement for analyzing candidate sentiment in responses.

2.10 Multi-Modal Emotion Recognition in AI Interviews

Several studies highlight multi-modal approaches to interview analysis:

- Suen et al. (2019) [10]: TensorFlow-based automatic personality recognition.
- Zhang et al. (2019) [11]: CNN-based face emotion recognition.
- Song et al. (2019) [12]: Multi-modal physiological emotion recognition.

These works suggest that integrating AI-based facial, voice, and text analysis could enhance our system's effectiveness in evaluating both technical and behavioral aspects of an interview.

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III. METHODOLOGY

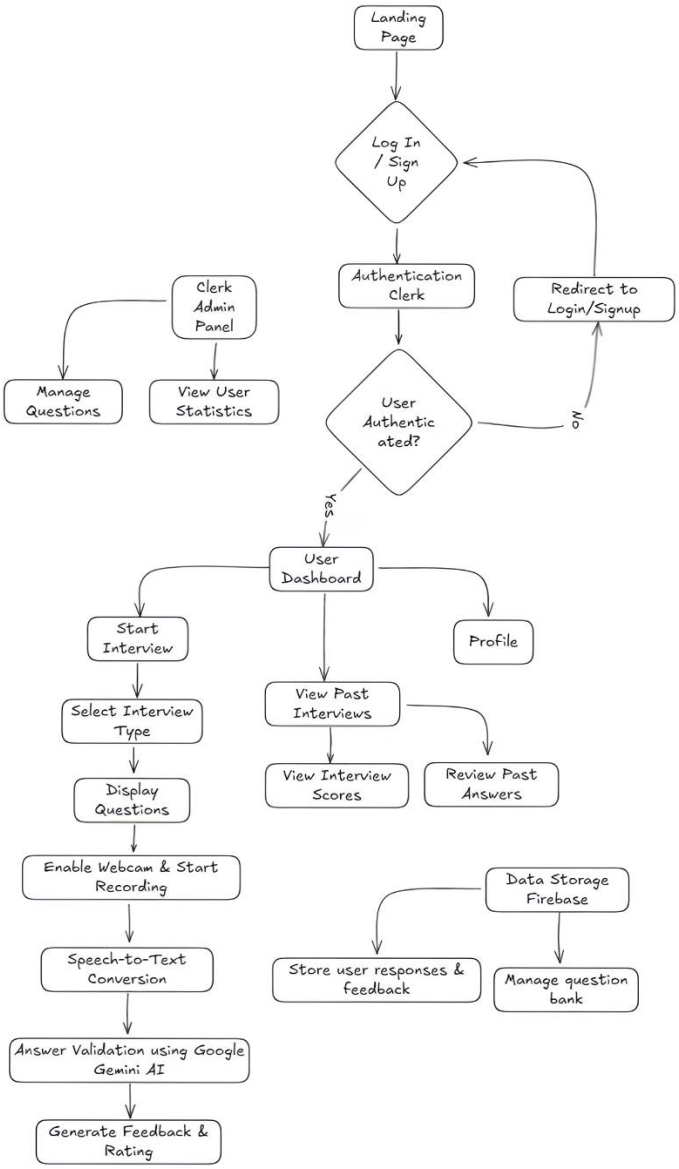

Fig. 1 Project Flowchart

The system follows a structured approach, integrating React, Firebase, Google Gemini AI, and Clerk authentication to facilitate AI-driven mock interviews. The key steps of the methodology are as follows:

1. User Authentication and Access Control

- Landing Page: The user begins at the landing page, where they can log in or sign up.
- Authentication via Clerk: The system uses Clerk for user authentication. If authentication fails, users are redirected to the login/signup page.

2. User Dashboard and Interview Selection

- Upon successful authentication, users are redirected to the dashboard, where they can:
  - Start a new interview.
  - View past interviews and feedback.
  - Update their profile.

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- When starting an interview:
  - The system allows users to select an interview type (e.g., technical, HR, or behavioral).
  - AI-generated questions are displayed dynamically.

3. User Dashboard and Interview Selection

- Voice & Text Processing:
  - The system enables webcam and microphone to record responses.
  - Speech-to-text conversion is performed for answer validation.
- AI-Based Evaluation:
  - Responses are analyzed by Google Gemini AI, which checks for relevance, accuracy, and fluency.
  - AI generates feedback and ratings based on the response quality.

4. Interview Review & Performance Tracking

- After completing an interview, users can view their scores and review past answers for self-improvement.
- Performance tracking is enabled through Firebase, where:
  - User responses and feedback are stored for future reference.
  - A question bank is maintained for dynamic question generation.

5. Admin Panel & Data Management

- Admins can manage questions in the database via a Clerk-admin dashboard.
- The Firebase backend facilitates:
  - User statistics tracking.
  - Storage of AI-generated feedback.

6. Deployment & Live Testing

- The application is hosted on Firebase, ensuring real-time data access.
- Live testing validates:
  - Authentication and access control.
  - AI-powered evaluation accuracy.
  - User experience and response analysis.

IV. IMPLEMENTATION

1. UI Development (Frontend):

The frontend is built using React and TypeScript, with Tailwind CSS for styling and ShadCN UI for a polished design. It includes key components like the landing page, authentication, user dashboard, and interview modules. Framer Motion and GSAP enhance user experience with smooth animations. The UI is designed for responsiveness, ensuring seamless functionality across different devices.

2. Database Creation (Firebase Firestore):

Firebase Firestore is used for real-time data storage and retrieval. It stores user profiles, interview records, questions, and AI-generated feedback in structured collections. Firestore ensures secure access control through authentication and rules, enabling smooth data synchronization while maintaining privacy and security.

3. Backend Development (Firebase Functions & API Integration):

The backend is powered by Firebase Functions, handling AI processing, user authentication via Clerk, and speech-to-text conversion. Google Gemini AI APIs analyze user responses and generate feedback. The backend ensures efficient request handling and secure communication between the frontend and AI model for real-time interaction.

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4. Frontend and Backend Integration:

The frontend communicates with Firebase Firestore to store and retrieve user data, while API calls to Firebase Functions process AI-driven feedback. Clerk manages authentication seamlessly, and Firebase SDKs enable real-time updates. Secure API interactions ensure smooth and responsive data flow between the frontend and backend.

5. Deployment and Hosting (Firebase Hosting & CI/CD):

The app is deployed using Firebase Hosting with GitHub Actions automating CI/CD. Firebase provides SSL security and performance monitoring to optimize speed and reliability. Updates are deployed with minimal downtime, ensuring a smooth user experience across different environments.

6. AI-Based Feedback & Scoring System:

Google Gemini AI processes user responses, providing structured feedback using NLP techniques. Speech-to-text conversion enables spoken answers to be analyzed. Firebase Functions handle real-time processing, delivering instant feedback. The AI model continuously improves based on user data, refining accuracy and adaptability for better interview assessments.

V. TECHNOLOGY STACK & SYSTEM DESIGN

Before developing the AI-powered mock interview application, we conducted a thorough **user requirement analysis** to understand the needs of individuals preparing for interviews.

Target Users:

- Job Seekers & Students preparing for technical/non-technical interviews.
- Individuals looking for AI-powered feedback to improve their responses.
- People who want structured practice with various types of interview questions.

Key User Needs & Functional Requirements:

Requirement	Description	Implementation Decision
Authentication System	Users need a secure login/signup process.	Used Clerk for authentication due to its ease of use & integration with Firebase.
Interview Question Bank	A diverse set of questions covering various domains.	Used Firebase Firestore for scalability and real-time data management.
AI Feedback System	Users need real-time AI-based assessment of answers.	Used Google Gemini AI for text analysis, feedback, and scoring.
Speech-to-Text Conversion	Allow users to respond verbally to simulate real interviews.	Integrated Google Speech API for voice-based responses.
Performance Tracking	Users should be able to review past responses & scores.	Used Firebase Firestore for storing interview history & scores.
Webcam & Microphone Support	Users should be able to record responses.	Integrated WebRTC & Browser APIs for media capture.
Multi-Device Compatibility	The system should work on desktops, tablets, and mobile devices.	Used React & TailwindCSS for responsive UI design.

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VI. FEATURES

The AI Mock Interview Application offers a comprehensive set of features designed to enhance users' interview preparation experience. Each feature has been thoughtfully developed to provide a seamless, interactive, and personalized mock interview environment.

1. User Authentication:

Secure authentication is implemented using Clerk, allowing users to create accounts, log in, and manage their profiles efficiently. Authentication ensures that each user's data—such as interview history and feedback—is private, safe, and accessible only to them.

2. Create and Manage Interviews:

Users can initiate new interviews based on selected domains or skill sets. Google Gemini AI dynamically generates personalized questions, creating diverse and targeted mock interview experiences. This flexibility helps users prepare for various job roles and industries.

3. Voice Recording and Speech Analysis:

The application allows users to record their responses using voice input, offering a more realistic interview experience. Speech-to-text technology accurately transcribes these responses, enabling further analysis and evaluation by the AI model.

4. AI-Powered Feedback and Evaluation:

The core feature of the app is its integration with Google Gemini AI, which evaluates user responses using advanced NLP techniques. The AI provides real-time, structured feedback on relevance, grammar, clarity, confidence, and coherence—guiding users to improve their communication and technical articulation.

5. Interview History and Performance Tracking:

All completed interviews, responses, and AI-generated feedback are securely stored in Firebase Firestore. Users can revisit past interviews to reflect on their performance and track progress over time, enabling continuous learning and skill enhancement.

6. Responsive and Intuitive UI:

The user interface is developed using React, TypeScript, and Tailwind CSS, with added UI components from ShadCN for a modern and professional look. Framer Motion is used for smooth transitions and animations, ensuring a visually appealing and user-friendly experience across devices.

7. Real-Time Data Sync and Notifications:

Firebase's real-time capabilities ensure that data such as response submissions, AI feedback, and interview statuses are updated immediately. This creates a seamless and responsive experience, keeping the user fully engaged during the session.

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VII. RESULT

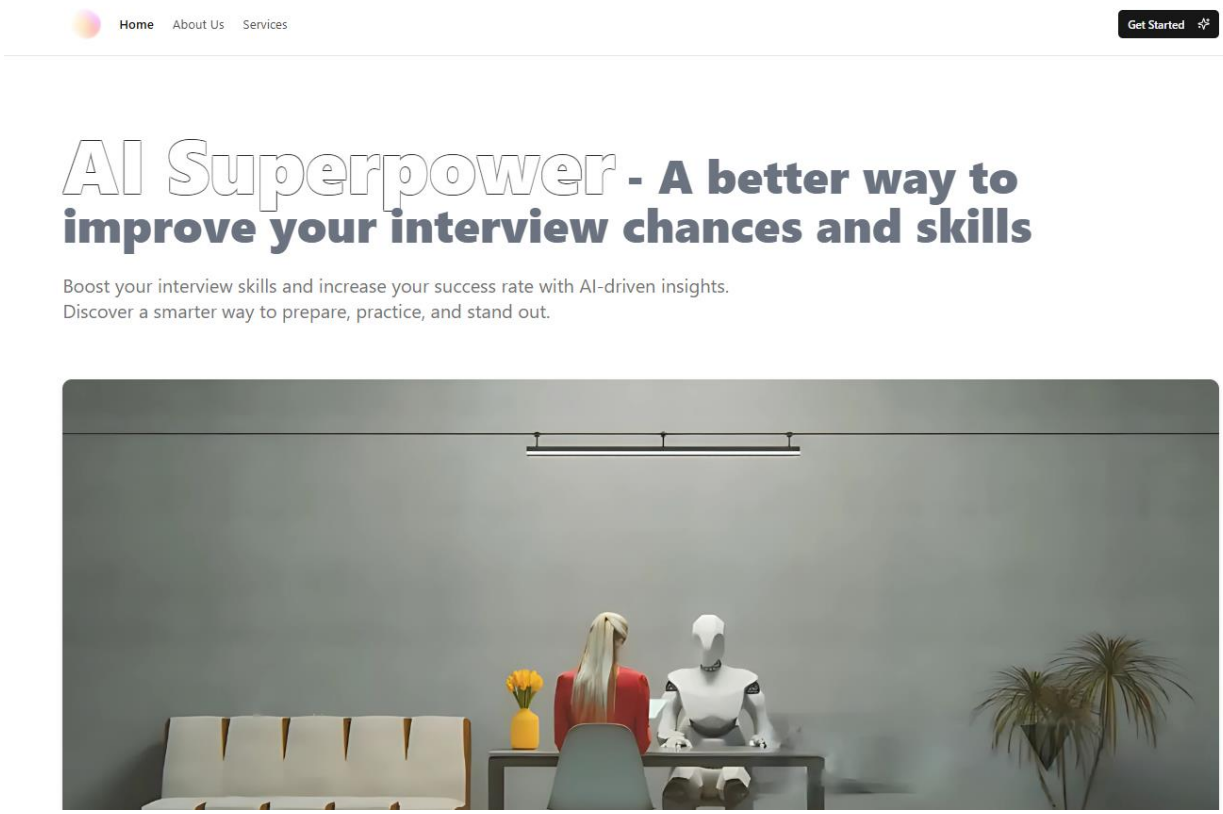

Fig. 2 Home Page

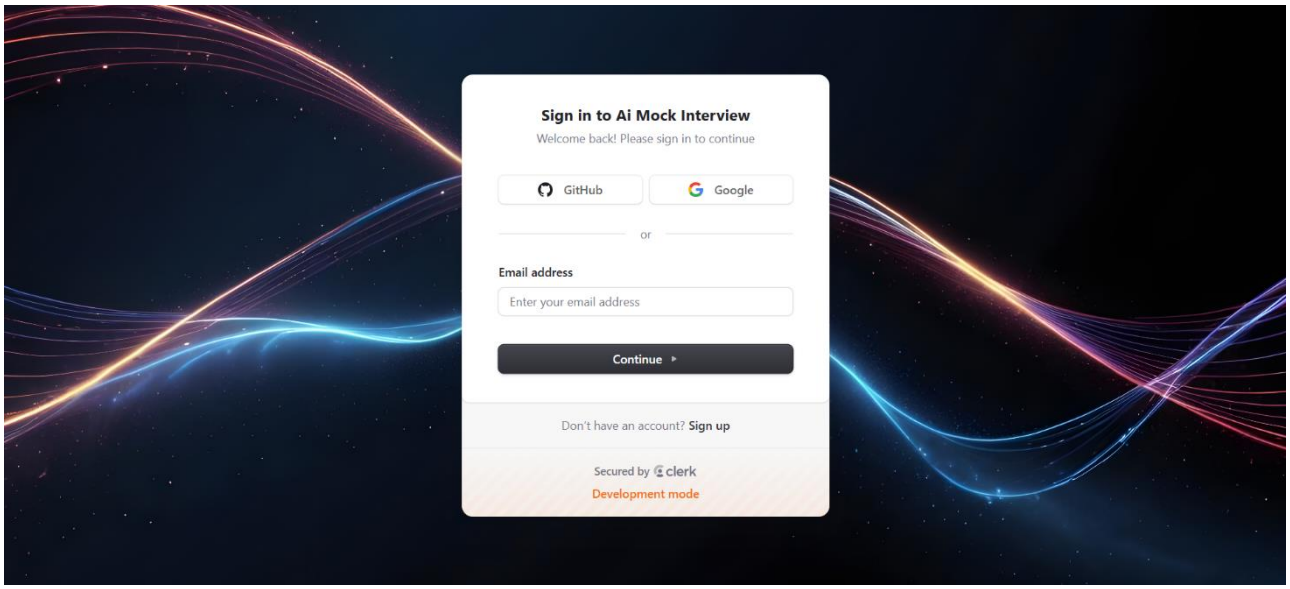

Fig. 3 Auth Page

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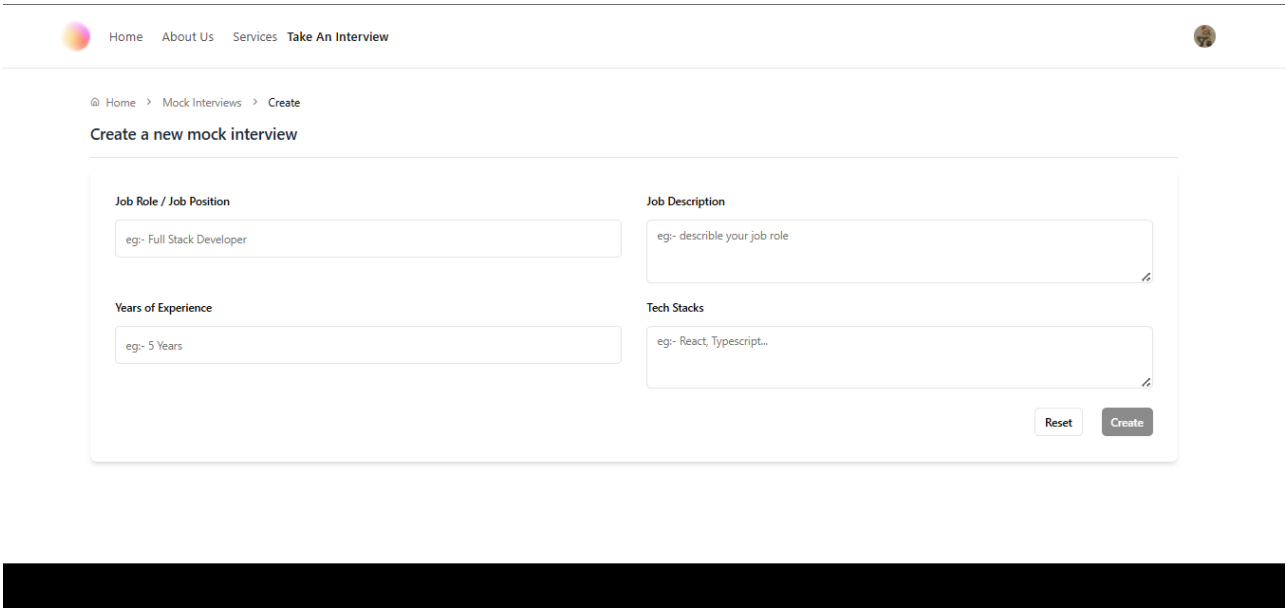

Fig. 4 Interview Form

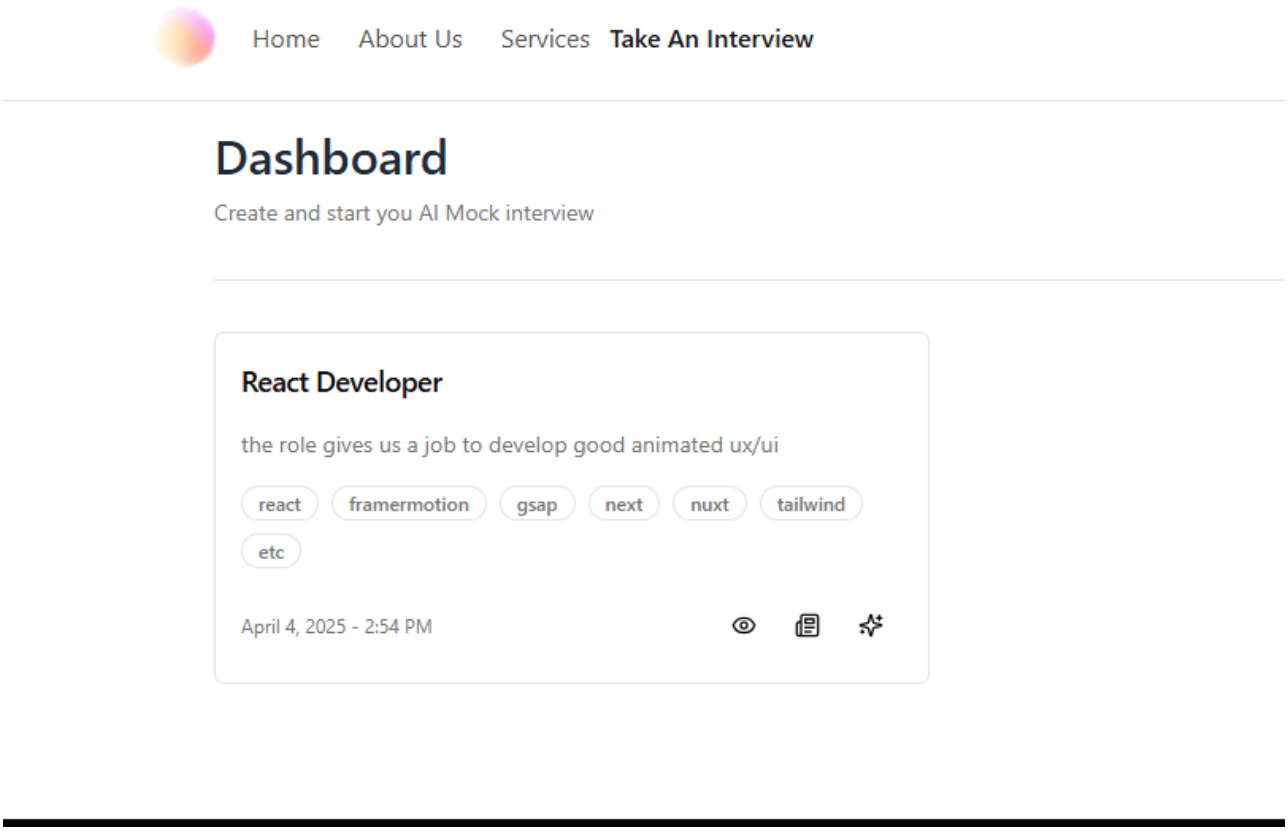

Fig. 5 Interview Dashboard

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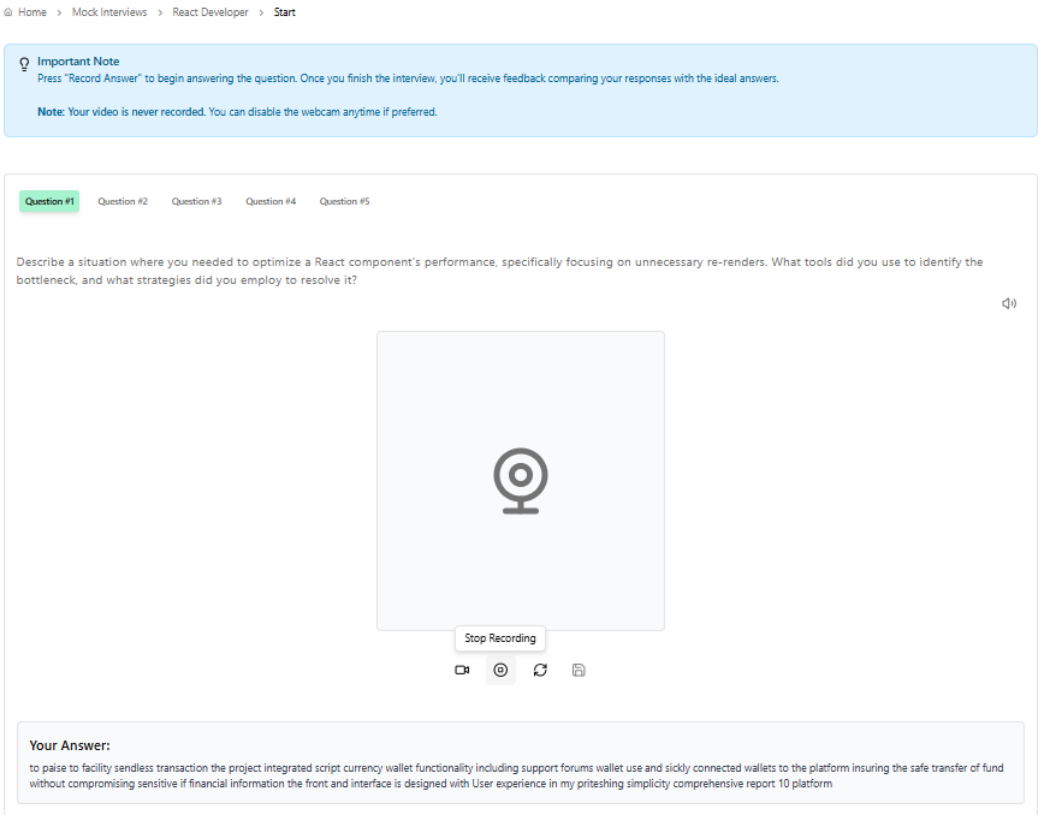

Fig. 6 Interview Page

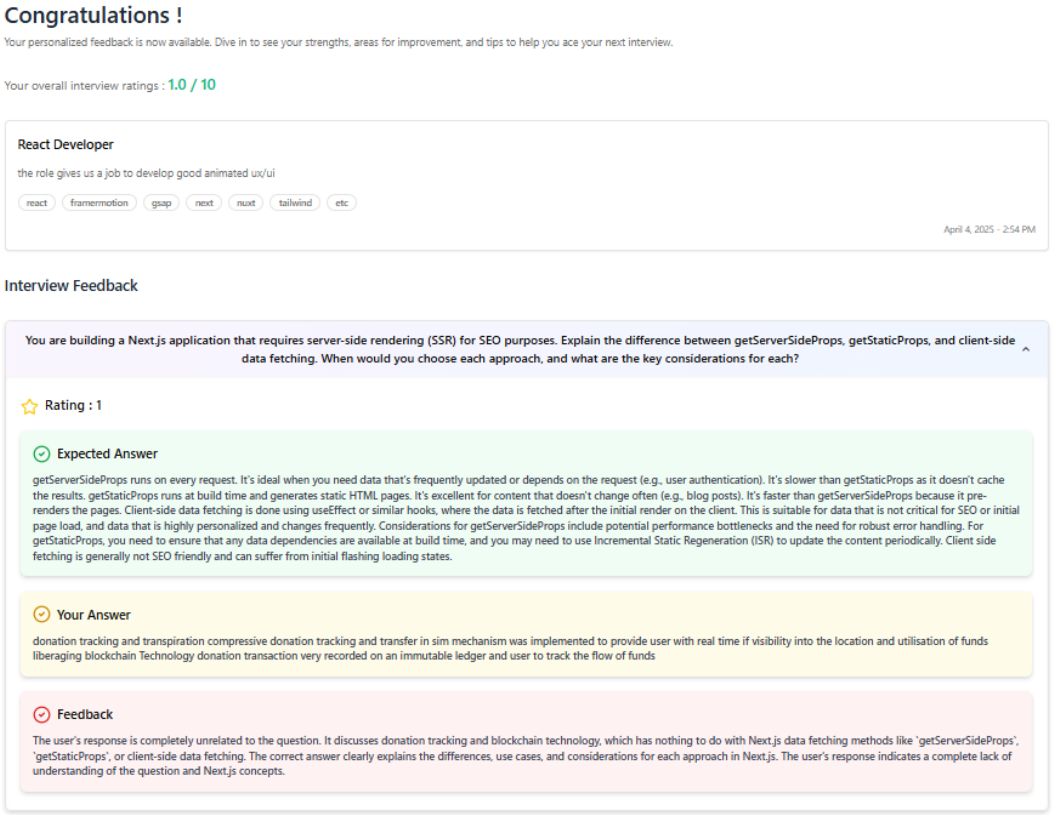

Fig. 7 Interview Feedback Page

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VIII. CONCLUSION

This research demonstrates the effectiveness of AI-driven assessments in bridging the gap between self-preparation and real-world interview performance. While the system offers accurate and data-driven feedback, future improvements can focus on reducing AI biases, enhancing soft-skill evaluation, and expanding industry-specific interview simulations.

With continuous advancements, AI-driven platforms like AI-PrepMate: AI-Assisted Mock Interview and Feedback System have the potential to revolutionize interview training, making it more accessible, personalized, and efficient for job seekers.

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