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AI-Based Job Interview Preparation Platform (Using MERN Stack and Gemini API)

Parth Santosh Mahadik*, Shaikh Waleed Nasim Ahmed**,
Rajan Rajeshkumar Pandit***, Rajeev Kumar Mahto****

* Department of Computer Science and Engineering,
Sandip University, Nashik, India.
Email: parthmahadik08@gmail.com

** Department of Computer Science and Engineering,
Sandip University, Nashik, India.
Email: shaikhwaleed204@gmail.com

*** Department of Computer Science and Engineering,
Sandip University, Nashik, India.
Email: rajanpandit5376@gmail.com

**** Department of Computer Science and Engineering,
Sandip University, Nashik, India.
Email: mahtorajeevkumar01@gmail.com

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Abstract:

This paper presents an intelligent web-based interview preparation platform that integrates the MERN stack (MongoDB, Express, React, Node.js) with the Gemini API to deliver adaptive mock interviews and AI-driven evaluation. The system aims to simulate realistic job inter- view environments, provide dynamic feedback, and assess candidates across communication, knowledge, and fluency metrics. The platform ensures scalability, low latency, and cost-effective API usage through caching and heuristic pre-processing. A pilot evaluation with four undergraduate students demonstrated measurable improvements in performance, confidence, and system responsiveness. The paper discusses architecture, implementation, results, and future enhancements for extending the system to speech and multimodal analysis.

Keywords — **Artificial Intelligence, Interview Preparation, MERN Stack, Gemini API, Web Application, Evaluation Metrics.**

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I. INTRODUCTION

Job interviews are critical milestones in the recruitment process. Traditional preparation methods such as question banks or peer interviews lack adaptability and objective feedback. The emergence of large language models (LLMs) has enabled systems to simulate human-like conversation and assessment capabilities.

This work introduces an AI-based interview preparation platform built using the MERN stack and Gemini API. The system dynamically generates domain-specific interview questions,

evaluates responses, and provides feedback on conceptual clarity, confidence, and communication. The design goal is to offer a scalable and low-cost web-based tool that enhances students' readiness for technical and HR interviews.

II. Related Work

Existing interview preparation tools like InterviewBuddy and Pramp primarily rely on pre- scripted dialogues or human evaluators. Research in AI-based scoring of open-ended responses has explored classical NLP approaches [1], [2]. With the advent of transformer-based models such as GPT and Gemini [3], [4], conversational AI has reached a stage where it can meaningfully assess candidate responses. However, few systems integrate these models into full-stack web applications with structured analytics and feedback. This study addresses that gap.

III. System Architecture

A. Overall Design

The platform adopts a client-server architecture (Fig. 1). The frontend, developed in React, manages the user interface and session states. The back- end, implemented in Node.js and Express, handles authentication, question orchestration, and Gemini API communication. MongoDB stores user profiles, transcripts, and feedback records. Redis caching optimizes repeated API calls.

B. Module Description

The system consists of several interconnected modules:

- User Management: Registration, JWT authentication, and profile handling.
- Interview Session: Domain and difficulty se- lection, real-time question flow.
- AI Adapter: Intermediary layer between Gemini API and backend server.
- Evaluation Engine: Uses both heuristic and AI-based methods for scoring.
- Analytics: Tracks performance metrics and progress over sessions.

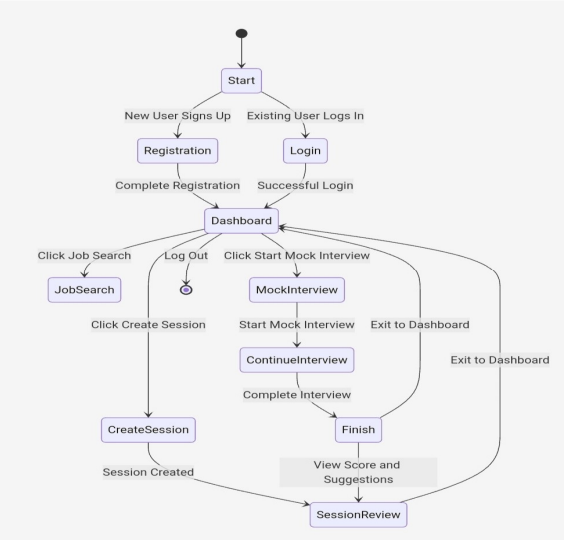

Figure I

Overall activity diagram of the ai-based interview platform

C. Evaluation Formula

A weighted evaluation model is used to score candidate responses:

$$S = wcC + wkK + wf F + wpP, \quad (1)$$

where C is communication, K is knowledge correctness, F is fluency, and P is professionalism. Default weights are wc = 0.25, wk = 0.40, wf = 0.20, wp = 0.15

IV. Implementation Details

The backend uses Express.js REST APIs for communication and integrates Gemini for generating and scoring responses. Request batching and local caching minimize latency and API cost. MongoDB ensures data persistence, while Redis manages frequently used prompts.

The frontend uses React.js with Tailwind CSS for a responsive user experience. WebSocket is employed for real-time interaction between user and

AI during interviews. API calls are authenticated using JSON Web Tokens to ensure secure communication.

V. Experimental Evaluation

A. Participants and Methodology

Four undergraduate computer science students participated in the pilot test. Each completed five AI-conducted mock interviews in technical and HR domains. Pre- and post-assessment surveys captured confidence and answer quality metrics.

B. Results and Metrics

The study measured expert-rated answer quality, self-reported confidence, and API performance metrics. Table I summarizes the findings.

TABLE I
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Metric	Pre-test	Post-test
Answer Quality (0–100)	63.2	75.5
Confidence (1–5 scale)	2.8	4.1
Average Latency (ms)	890	420
API Calls per Session	6.3	4.2

The platform achieved a 12.3-point improvement in answer quality and a 46% latency reduction. Participants reported higher satisfaction and confidence levels.

VI. Discussion

The system effectively demonstrated how AI can replicate interactive interview experiences. Gemini- based scoring allowed nuanced feedback that im- proved self-learning. However, limitations include potential LLM hallucinations, API dependency, and bias in evaluation. Data privacy is also critical; transcripts are stored securely with encryption.

VII. Future Enhancements

Planned extensions include:

1) Speech and Video Support: Integrating multimodal inputs using speech-to-text and emotion analysis.
2) Adaptive Learning: Reinforcement-based question difficulty adjustment.
3) Explainable AI: Providing justification for scores and evaluation outcomes.
4) Institutional Integration: APIs for LMS and placement training modules.

VIII. CONCLUSION

This study presents a complete MERN-based AI interview preparation system integrated with Gemini API for dynamic question generation and response evaluation. Pilot results from four students demonstrate significant improvements in performance and confidence. The proposed system shows potential as a scalable educational tool for career readiness programs.

IX. ACKNOWLEDGMENT

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