

AI Interview Practice Partner: An Intelligent Mock Interview System Using NLP And Generative AI

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Abstract- *The rapid growth of the technology sector has intensified the demand for effective interview preparation tools that can help candidates develop both technical knowledge and soft skills. Traditional interview preparation methods, including coaching sessions and static question banks, often lack personalized feedback and real-time performance evaluation. This paper presents an AI Interview Practice Partner, an intelligent web-based mock interview system that leverages Natural Language Processing (NLP) and Generative AI to simulate realistic interview environments. The proposed system enables users to select interview categories such as technical, HR, or aptitude-based sessions at varying difficulty levels. User responses are analyzed in real time using NLP techniques for relevance, clarity, correctness, and logical flow. Generative AI models power dynamic question generation and conversational interview flow. The system provides instant personalized feedback, performance scoring across multiple dimensions including communication, technical knowledge, confidence, and behavioral attributes. Experimental results demonstrate that the proposed system significantly enhances user interview readiness, reduces anxiety, and improves performance consistency compared to existing static platforms. The architecture follows a client-server model with modular components for authentication, question generation, response evaluation, and feedback delivery, ensuring scalability and extensibility for future enhancements such as voice-based interviews and emotion detection.*

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I. INTRODUCTION

In today's highly competitive employment landscape, interview performance serves as a decisive factor in shaping career trajectories. Employers across industries seek candidates who demonstrate not only domain-specific expertise but also effective communication, critical thinking, and professional confidence. However, a significant proportion of students and job seekers lack access to quality

interview training resources that provide structured practice and objective evaluation.

Traditional interview preparation approaches, such as classroom coaching, printed study materials, and peer-conducted mock interviews, are constrained by several limitations. These methods are often time-intensive, costly, and dependent on the availability of experienced trainers. Moreover, feedback delivered through conventional means tends to be subjective and inconsistent, offering limited insight into specific areas requiring improvement. The absence of systematic progress tracking further diminishes the effectiveness of these approaches.

The emergence of Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP) has catalyzed the development of intelligent educational systems capable of simulating complex human interactions. AI-powered platforms can generate contextually relevant questions, analyze open-ended responses, and deliver actionable feedback in real time. Generative AI, in particular, has demonstrated remarkable capabilities in producing human-like conversational exchanges, making it well-suited for interview simulation applications.

This paper introduces the AI Interview Practice Partner, a web-based intelligent mock interview system designed to address the shortcomings of existing preparation methodologies. The system integrates NLP-based response evaluation with Generative AI-driven conversational flow to create a comprehensive, personalized, and scalable interview preparation platform. Users can practice across multiple domains and difficulty levels while receiving granular feedback on their performance metrics.

II. LITERATURE REVIEW

The application of Artificial Intelligence in education and recruitment has gained substantial attention in recent years. AI-based interview systems aim to automate candidate assessment by leveraging machine learning algorithms and natural language understanding. Research by Bhatia and Gupta [7] highlights that AI-driven interview platforms can assess technical knowledge, communication skills, and logical

reasoning with greater consistency than human evaluators. These systems operate without time or geographical constraints, making them suitable for large-scale deployment.

Natural Language Processing constitutes a foundational component of intelligent interview evaluation. Techniques such as tokenization, named entity recognition, sentiment analysis, and semantic similarity measurement are employed to assess the quality of candidate responses. Kaur and Singh [8] proposed NLP-based models that compare user answers against reference responses using cosine similarity and keyword extraction. While effective for structured evaluation, challenges persist in handling diverse answer styles, contextual nuances, and domain-specific terminology.

Online learning platforms such as Coursera, Udemy, and LinkedIn Learning have transformed skill acquisition paradigms. However, these platforms predominantly focus on content delivery through video lectures and quizzes, lacking interactive mechanisms for evaluating open-ended interview responses. Research indicates that platforms incorporating interactive assessment elements yield superior learning outcomes, yet interview preparation demands a more sophisticated evaluation framework capable of analyzing descriptive responses and communication quality.

A comparative analysis of existing interview preparation tools reveals critical gaps. Most available systems provide static question banks without intelligent response evaluation. Manual mock interviews, while valuable, are limited by cost, availability, and evaluator subjectivity. AI-powered alternatives such as Pramp and InterviewBuddy offer partial automation but often lack comprehensive feedback mechanisms, multi-dimensional scoring, and adaptive difficulty adjustment. The proposed AI Interview Practice Partner addresses these limitations through an integrated approach combining Generative AI-powered conversation management with NLP-based multi-parameter evaluation.

III. PROPOSED SYSTEM

The proposed AI Interview Practice Partner is an intelligent web-based application designed to simulate realistic interview experiences through the integration of NLP and Generative AI technologies. The system addresses the fundamental limitations of existing interview preparation tools by providing automated question generation, real-time response analysis, personalized feedback, and longitudinal performance tracking within a unified platform.

The system supports three primary interview categories: Technical, Human Resources (HR), and Aptitude-

based interviews. Users can further customize their sessions by selecting difficulty levels ranging from beginner to advanced, ensuring that candidates at varying stages of career preparation receive appropriately challenging questions. Domain-specific question banks are maintained and dynamically augmented through Generative AI to ensure comprehensive coverage of interview topics.

The core evaluation engine employs NLP techniques to analyze user responses across multiple parameters. Relevance scoring determines the degree to which a response addresses the posed question. Clarity assessment evaluates the coherence and structure of the answer. Correctness verification compares key concepts against reference knowledge bases. Additionally, the system evaluates logical flow, completeness, and the use of supporting examples or evidence.

A distinguishing feature of the proposed system is its conversational interview flow powered by Generative AI. Unlike static question-answer systems, the AI Interview Practice Partner conducts interviews in a natural, adaptive manner, beginning with rapport-building small talk before transitioning to substantive questions. The system adjusts its line of questioning based on user responses, requests elaboration on brief answers, and handles edge cases such as irrelevant responses or gibberish input gracefully.

Performance evaluation is delivered through a multi-dimensional scoring framework. Upon completion of an interview session, users receive scores across five categories: overall performance, communication skills, technical knowledge, confidence level, and behavioral attributes. Detailed strengths and weaknesses are identified, and actionable recommendations are provided to guide improvement. All session data is persisted to enable progress tracking across multiple practice attempts.

IV. SYSTEM ARCHITECTURE

The system architecture of the AI Interview Practice Partner follows a modular client-server paradigm comprising three distinct layers: the Presentation Layer, the Application Logic Layer, and the Data Persistence Layer. This layered design promotes separation of concerns, facilitates independent scaling of components, and enables straightforward integration of future enhancements.

The Presentation Layer is implemented as a responsive web interface using modern frontend technologies including React.js, HTML5, CSS3, and JavaScript. This layer handles user interactions such as registration, session

configuration, interview participation, and performance review. The interface communicates with the backend through RESTful API endpoints, ensuring clean decoupling between client and server components.

The Application Logic Layer constitutes the intelligence core of the system. It encompasses several modular components: the Authentication Module manages user identity verification through Firebase Authentication with secure token-based access control; the Session Manager orchestrates interview session lifecycle including initialization, message exchange, and termination; the Question Generation Engine leverages Generative AI models to produce contextually appropriate interview questions based on the selected domain, role, and difficulty parameters; the Response Evaluation Module applies NLP techniques to analyze user answers and compute multi-dimensional performance scores; and the Feedback Generator synthesizes evaluation results into structured, actionable feedback.

The Data Persistence Layer manages storage and retrieval of user profiles, interview session records, response transcripts, and performance analytics. The database design supports efficient querying for historical performance comparisons and trend analysis.

V. IMPLEMENTATION

The implementation of the AI Interview Practice Partner follows a structured development methodology encompassing requirement analysis, system design, modular development, testing, and deployment. The technology stack is selected to ensure performance, scalability, and maintainability across all system components.

The frontend application is developed using React.js, providing a component-based architecture that supports efficient rendering and state management. The user interface enables seamless navigation through registration, session configuration, real-time interview interaction, and performance dashboard views. Responsive design principles ensure compatibility across desktop and mobile devices.

The backend server is implemented using Python with the Flask web framework, chosen for its lightweight architecture and extensive library ecosystem. Flask-CORS middleware is configured to handle cross-origin resource sharing for secure communication between the frontend and backend services. Firebase Authentication is integrated for user identity management, providing secure token-based access control through a custom decorator that validates Firebase ID tokens on protected API e

ndpoints.

The Generative AI component utilizes the Anthropic Claude API as the primary language model for conducting interview conversations. A carefully engineered system prompt defines the interview persona, flow structure, and response format requirements. The model is instructed to conduct interviews following a natural progression: initial small talk for rapport building, gradual transition to domain-specific questions, and concluding with a comprehensive performance summary. The system prompt enforces structured JSON output format to facilitate reliable parsing of interview responses and evaluation scores.

Interview sessions are managed through a stateful session architecture. Each session maintains conversation history, exchange counters, timing information, and configuration parameters. The chat endpoint injects contextual metadata including exchange count, question count, and elapsed time to enable the AI model to pace the interview appropriately and generate summaries at the designated conclusion point.

Text-to-speech functionality is integrated through the ElevenLabs API, enabling voice-based delivery of interview questions. This feature enhances the realism of the interview simulation by providing auditory feedback in addition to text-based interaction. Multiple voice styles are supported to accommodate user preferences.

VI. RESULTS AND DISCUSSION

The AI Interview Practice Partner was evaluated through a series of controlled experiments involving a cohort of 50 participants comprising undergraduate students and recent graduates from the Department of Artificial Intelligence and Data Science at Rathinam Technical Campus, Coimbatore. Participants were divided into two groups: an experimental group using the proposed system and a control group using conventional interview preparation methods over a four-week period.

Performance metrics were assessed across five dimensions: overall interview score, communication quality, technical accuracy, confidence level, and behavioral attributes. Each metric was scored on a scale of 0 to 100. The experimental group demonstrated statistically significant improvements across all evaluation dimensions compared to the control group, validating the effectiveness of the AI-driven approach.

The system achieved an average response evaluation accuracy of 87.3 percent when benchmarked against expert

human evaluator assessments. Feedback quality was rated positively by 92 percent of participants, with users reporting that the personalized recommendations helped identify specific areas for improvement. The average session completion time was 14.2 minutes, aligning with the configurable duration parameter of the system.

TABLE I PERFORMANCE EVALUATION RESULTS

Evaluation Metric	Experimental Group	Control Group
Overall Score	82.6	68.4
Communication Score	79.8	65.2
Technical Score	85.1	70.9
Confidence Score	80.3	62.7
Behavioral Score	83.5	67.1

Table I presents the comparative performance evaluation results between the experimental and control groups. The experimental group utilizing the AI Interview Practice Partner achieved notably higher scores across all five evaluation dimensions, with the most pronounced improvement observed in confidence scores, reflecting a 28.1 percent relative increase attributable to repeated practice in a non-judgmental AI-mediated environment.

TABLE II COMPARISON OF EXISTING AND PROPOSED SYSTEMS

Feature	Existing Systems	Proposed System
Interview Simulation	Static / Limited	Dynamic and Realistic
Question Generation	Pre-defined Banks	AI-Powered Dynamic
Response Evaluation	Manual / None	NLP-Based Automated
Feedback Mechanism	Generic / Absent	Personalized and Instant
Performance Tracking	Not Available	Multi-Session Analytics
Conversational Flow	Absent	Generative AI-Driven
Accessibility	Time-Restricted	24/7 Online Access
Scalability	Low	High

Table II illustrates the comprehensive feature comparison between existing interview preparation systems and the proposed AI Interview Practice Partner. The proposed system demonstrates clear advantages in every evaluated

dimension, most notably in conversational flow management through Generative AI integration and multi-dimensional automated performance evaluation, capabilities that are absent in conventional systems.

VII. CONCLUSION

This paper presented the AI Interview Practice Partner, an intelligent mock interview system that integrates Natural Language Processing and Generative AI to deliver a comprehensive, personalized interview preparation experience. The system successfully addresses critical limitations of existing preparation methodologies by providing dynamic question generation, real-time response evaluation, multi-dimensional performance scoring, and actionable feedback within an adaptive conversational framework.

Experimental evaluation demonstrated that users of the proposed system achieved significantly improved performance across all measured dimensions compared to those relying on conventional preparation methods. The system's NLP-based evaluation engine achieved 87.3 percent accuracy relative to expert human assessments, while 92 percent of participants reported satisfaction with the quality of personalized feedback received.

The modular client-server architecture ensures scalability and facilitates straightforward integration of additional capabilities. The implementation leverages established technologies including React.js, Flask, Firebase Authentication, and the Anthropic Claude API, ensuring reliability and maintainability. The AI Interview Practice Partner represents a practical and effective contribution to the domain of AI-assisted education, demonstrating the potential of Generative AI in creating interactive, intelligent learning systems that enhance employability skills and career readiness.

VIII. FUTURE WORK

Several avenues for future enhancement have been identified to extend the capabilities of the AI Interview Practice Partner. Integration of speech recognition technology would enable voice-based interview sessions, providing a more authentic simulation of real-world interview dynamics and allowing evaluation of verbal communication skills, pronunciation, and fluency.

Incorporation of emotion and sentiment analysis through facial expression recognition and voice tone analysis would provide deeper insights into candidate confidence, stress levels, and emotional composure during interview

sessions. Resume parsing and analysis modules could enable personalized question generation based on individual candidate profiles, work experience, and skill declarations.

Advanced analytics dashboards with visualization capabilities would offer users granular insights into performance trends across multiple sessions. Multilingual support would expand the accessibility of the platform to non-English speaking candidates. Integration with recruitment platforms and job portals could facilitate seamless transitions from practice sessions to actual job applications, creating a holistic career preparation ecosystem.

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