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Advanced AI Interview Simulation and Evaluation System

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Abstract: The Interview-based AI Model is an intelligent and interactive virtual interview system designed to automate the initial stages of candidate screening in recruitment processes. Leveraging advanced Natural Language Processing (NLP) and Machine Learning (ML) techniques, the system simulates domain-specific interview scenarios, analyzes candidate responses in real time, and provides feedback on communication skills, emotional intelligence, confidence, and domain knowledge. Additionally, it integrates voice-to-text conversion and AI-generated answer detection to ensure authenticity and assess speaking proficiency. This scalable and unbiased tool aims to improve hiring efficiency by offering consistent evaluations and detailed performance summaries, reducing human bias and manual effort.

Keywords: Candidate Screening, Machine Learning, Natural Language Processing, Performance Summary Generation, Virtual Interview System.

1 INTRODUCTION

Interviews are a fundamental component of recruitment and professional evaluation, as they are used to assess candidates' technical competence, communication ability, confidence, and interpersonal skills. Despite their importance, effective interview preparation remains inaccessible to many job seekers due to the high cost, limited availability, and subjectivity associated with traditional coaching and mock interview methods. Human-led interview training often lacks consistency and scalability, while feedback quality varies depending on the experience and bias of evaluators. Consequently, many candidates enter interviews without adequate practice, structured guidance, or objective performance assessment. Advances in Artificial Intelligence (AI), particularly in Natural Language Processing (NLP) and Machine Learning (ML), have enabled the development of intelligent interview simulation systems capable of replicating realistic interview scenarios and delivering automated feedback. Studies indicate that AI-guided interview simulations can significantly improve interview readiness by reducing anxiety and enhancing confidence through repeated, low-pressure practice sessions [1]. Such systems allow users to practice interviews independently while receiving standardized and unbiased evaluation, overcoming the limitations of time-bound and resource-intensive human coaching.

Recent research has explored the integration of generative AI and conversational agents to improve the realism and effectiveness of interview training platforms. AI-enhanced interview environments have demonstrated measurable improvements in response structuring, domain knowledge articulation, and communication skills across educational and professional settings [2]. However, many existing platforms primarily emphasize interaction and user experience, offering limited analytical depth in assessing response relevance, clarity, and confidence through quantitative evaluation methods. Moreover, existing AI-based interview tools continue to face challenges related to bias, transparency, and user trust. Research suggests that user perception of AI evaluators can influence performance outcomes, highlighting the need for consistent, explainable, and objective evaluation mechanisms [3]. In addition, several domain-specific interview simulation systems—particularly those designed for academic or medical training—lack adaptability and fail to provide a unified assessment framework applicable to technical, HR, and behavioral interview scenarios [4].

To address these limitations, this project proposes an AI Interview Simulation and Evaluation System that delivers a comprehensive and scalable interview preparation solution. The system generates domain-specific interview questions and evaluates user responses using NLP-based semantic analysis, sentiment and confidence assessment, and automated scoring techniques. By providing real-time feedback, performance analytics, and personalized recommendations, the proposed system aims to enhance interview preparedness, communication effectiveness, and confidence while reducing reliance on subjective human evaluation.

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2 LITERATURE SURVEY

Artificial Intelligence (AI) has been increasingly adopted in interview training and candidate evaluation to address limitations associated with traditional human-led interview preparation. Sarıköse et al. proposed an AI-guided interview simulation framework aimed at improving employability and reducing interview anxiety among nursing and midwifery students. Their quasi-experimental study demonstrated that AI-driven interview practice significantly enhanced confidence and communication skills; however, the system was restricted to a specific academic domain and lacked adaptive, multi-domain interview evaluation capabilities [1]. Nofal et al. explored AI-enhanced interview simulations within a metaverse environment by integrating virtual reality (VR) and generative conversational AI. The study highlighted improvements in engagement, realism, and professional skill development through immersive interview experiences. Despite these advantages, the approach required specialized VR hardware and did not focus on detailed NLP-based evaluation of response relevance, confidence, or communication clarity [2].

J. V. Barpute et al. investigated the use of generative AI for interview simulations in biology education, emphasizing its role in enhancing students' research communication and structured response formulation. While the results showed improved articulation and preparedness, the system primarily addressed educational interviews and did not include real-time scoring, sentiment analysis, or recruitment-oriented performance metrics [3]. F. Pehar examined the adoption of virtual interviewers in marketing research, analyzing regional and demographic factors affecting user acceptance. The study demonstrated that AI-based interviewers can improve scalability and cost efficiency; however, it did not incorporate automated evaluation models for assessing candidate performance, nor did it address personalized feedback mechanisms [4].

S. Muppidi et al. evaluated the effectiveness of an AI-integrated VR oral training application designed to reduce public speaking and interview anxiety. Their findings indicated significant reductions in anxiety levels and improved speaking confidence. Nevertheless, the system focused primarily on behavioral comfort and did not provide comprehensive analysis of technical correctness, answer relevance, or communication quality [5]. R. Gacitúa et al. conducted an interview-based study on AI-assisted decision-making in aviation, highlighting the supportive role of AI systems in complex evaluation processes. Although the research underscored the importance of AI-driven assistance, it was centered on expert decision-making rather than candidate interview preparation or automated performance assessment [6].

F. Shahzad et al. proposed modular AI agents for conducting transportation-related surveys and interviews, demonstrating improved engagement, transparency, and operational efficiency. While the modular design offered scalability benefits, the system did not evaluate interview skills such as confidence, fluency, or domain knowledge, limiting its applicability to recruitment-focused interview simulation [7]. S. H. Oh et al. analyzed pharmacy students' perceptions of AI-based interview software used for career preparation. The study reported positive user experiences and increased readiness for interviews; however, evaluation relied largely on subjective user feedback and predefined scoring criteria, rather than advanced NLP-based semantic and sentiment analysis [8].

S. Rajbhar et al. introduced the REIT architecture for requirements elicitation interview training using robotic and virtual tutors. Their framework provided structured guidance during interviews but lacked adaptive evaluation, real-time confidence analysis, and automated feedback based on linguistic and emotional features [9]. Many researchers investigated how user judgment of AI models is influenced by system descriptions in job interview training contexts. The study revealed that perceptions of AI credibility can bias user performance, emphasizing the need for transparent and explainable AI evaluation mechanisms. However, the research did not propose a concrete technical framework to mitigate such bias in interview assessment systems [10]-[12].

3 PROBLEM STATEMENT

Interview preparation is a critical requirement for students, fresh graduates, and professionals seeking employment; however, existing preparation methods are often ineffective, expensive, and inaccessible. Traditional interview coaching and mock interviews rely heavily on human evaluators, making them time-consuming, costly, and limited in scalability. Moreover, such methods suffer from subjective judgment, inconsistency in feedback quality, and potential evaluator bias, which prevents candidates from receiving fair and reliable performance assessment. Most available online interview preparation tools provide either static question sets or generic feedback, failing to evaluate essential parameters such as answer relevance, communication clarity, confidence, and emotional tone in real time. Candidates are often unaware of their specific weaknesses and lack actionable insights to improve performance. Additionally, existing systems do not offer continuous performance tracking or personalized guidance tailored to individual skill levels and domains.

Therefore, there is a need for an intelligent, scalable, and unbiased interview preparation system that can simulate realistic interview scenarios, objectively evaluate candidate responses, and provide real-time, personalized feedback. The absence of such a comprehensive AI-driven solution motivates the development of the AI Interview Simulation and Evaluation System, which aims to enhance interview readiness while minimizing dependence on subjective human evaluation.

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4 PROPOSED METHODOLOGY

The proposed AI Interview Simulation and Evaluation System is an intelligent, AI-driven framework designed to automate interview preparation and early-stage candidate evaluation. The system integrates advanced Large Language Models (LLMs), Natural Language Processing (NLP), and Machine Learning (ML) techniques to simulate realistic interview scenarios, analyze candidate responses, and provide real-time feedback and performance assessment. The primary objective of the system is to offer a scalable, unbiased, and interactive interview preparation platform for students, fresh graduates, and professionals. The proposed system follows a modular architecture, where each module performs a specific function within the interview lifecycle, including authentication, interview configuration, question generation, response capture, evaluation, and result visualization. The Hence architecture and data flow of the proposed system are illustrated in the block diagram shown in Fig. 1. This modular design improves system scalability, maintainability, and adaptability to different interview domains.

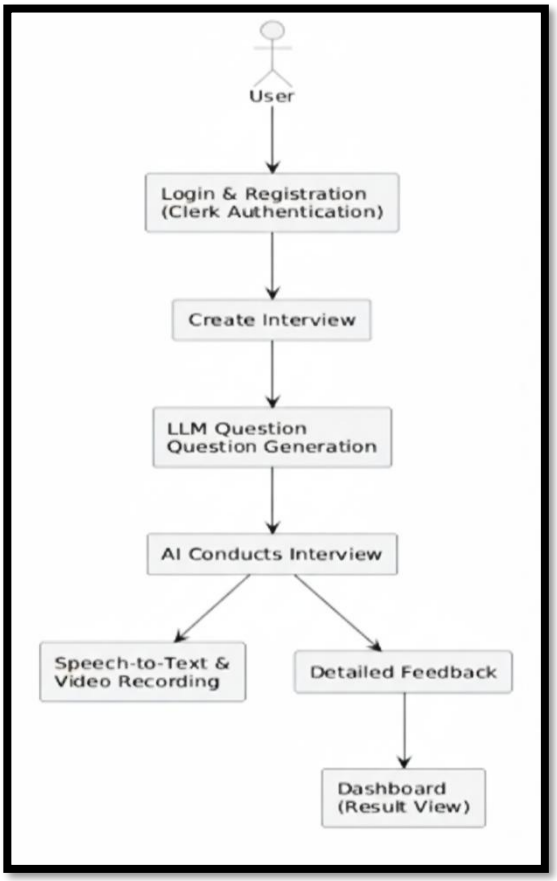

Fig. 1. Block Diagram of the Proposed AI Interview Simulation and Evaluation System

As shown in Fig. 1, the system begins with user authentication and profile management, followed by interview configuration based on the selected domain and difficulty level. A large language model generates domain-specific interview questions, and the AI interviewer conducts the interview in a structured sequence. User responses are captured through voice or text input, processed using speech-to-text and NLP-based techniques, and evaluated for relevance, communication quality, and confidence. The final results are presented through an analytical dashboard, providing detailed feedback and performance insights.

As illustrated in Fig. 1, the Login and Registration module ensures secure access to the system using authentication services. Once authenticated, users create an interview by selecting parameters such as interview domain (technical, HR, or behavioral), difficulty level, and interview type. These inputs are forwarded to the AI question-generation module, enabling personalized and context-aware interview sessions. The Question Generation module, shown in Fig. 1, utilizes a Large Language Model (Gemini AI) to dynamically generate interview questions aligned with the selected domain and difficulty level. Unlike static question banks, the LLM generates context-aware and progressive questions, closely simulating real-world interview conditions and improving interview realism. The AI Interview Execution module, depicted in Fig. 1, manages the interaction between the AI interviewer and the user. Interview questions are presented sequentially, and user responses are captured through voice or text input. Voice responses are processed using speech-to-text conversion, enabling accurate textual representation for further analysis. Optional video recording is included to support future enhancements such as emotion or facial expression analysis.

As shown in Fig. 1, captured responses are forwarded to the Evaluation module, where NLP and ML algorithms analyze both content and delivery of each answer. Semantic similarity techniques assess answer relevance and correctness, while sentiment and confidence analysis models evaluate communication clarity, tone, and fluency. Automated scoring ensures objective, unbiased, and consistent evaluation. The Feedback and Dashboard modules, illustrated in Fig. 1, generate detailed qualitative and quantitative feedback based on evaluation results. Performance scores, strengths, weaknesses, and improvement suggestions are displayed through the dashboard interface, allowing users to track progress across multiple interview sessions and identify skill gaps effectively. The key features of the proposed system, as summarized from Fig. 1, include:

- Automated and unbiased interview evaluation
- Real-time feedback and scoring
- Scalable architecture supporting multiple users
- Domain-specific and adaptive question generation
- Performance analytics and progress tracking

5 EXPERIMENTAL SETUP

The experimental setup of the proposed AI Interview Simulation and Evaluation System is designed to evaluate the system's functionality, responsiveness, and effectiveness in conducting AI-driven interview sessions and generating performance feedback under real-world usage conditions. The experiments focus on validating interview execution, response analysis, and result visualization using the deployed web-based platform.

5.1 Hardware Setup

The system was tested on a standard computing environment suitable for web-based AI applications. The minimum hardware configuration used for experimentation is as follows:

- Processor: Intel Core i5 / AMD Ryzen 5
- RAM: 8 GB
- Storage: 256 GB SSD
- Internet Connectivity: Minimum 5 Mbps stable internet connection

This configuration ensures smooth execution of interview sessions, real-time response submission, and dashboard rendering without noticeable latency.

5.2 Software Environment

The system software is developed using Embedded C / Arduino programming language and implemented through the Arduino Integrated Development Environment (IDE). The firmware performs the following functions:

- Operating System: Windows / macOS / Linux
- Frontend: React / Next.js
- Backend: Node.js / Python
- Database: Supabase (PostgreSQL)
- Web Browsers: Google Chrome, Mozilla Firefox, Microsoft Edge

Serial communication protocols are used to interface the GPS and GSM modules with the Arduino controller.

6 SYSTEM ARCHITECTURE

The system architecture of the proposed AI Interview Simulation and Evaluation System is designed as a modular and layered framework that integrates secure authentication services, large language models, natural language processing techniques, speech processing, and automated evaluation mechanisms. The architecture ensures scalability, real-time interaction, and objective assessment of interview performance. The final architecture consists of multiple functional modules that interact through a centralized processing pipeline to conduct interviews, Analyze candidate responses, and generate feedback. The system architecture is shown in Fig. 2.

The system provides a web-based user interface through which users can register, log in, configure interview sessions, participate in AI-driven interviews, and view results. This module ensures intuitive interaction and seamless navigation throughout the interview preparation process. The authentication module manages secure user login and registration using authentication services. It maintains user session information and profile data, enabling personalized interview history storage and performance tracking.

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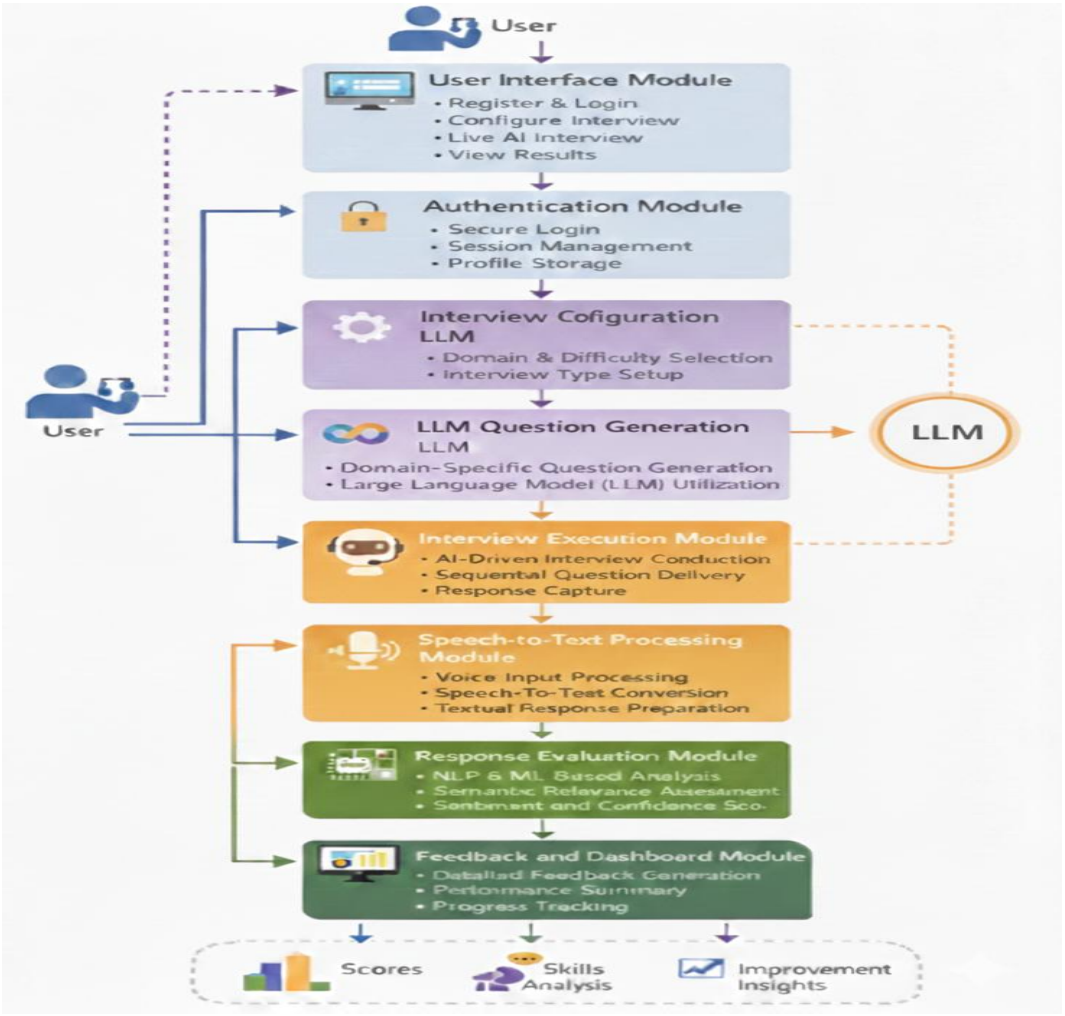

Fig. 2. System Architecture of Proposed System

This module allows users to select interview parameters such as domain (Technical, HR, or Behavioral), difficulty level, and interview type. These configurations act as input parameters for the AI-based question generation process. The question generation module employs a Large Language Model to dynamically generate domain-specific and context-aware interview questions. The generated questions adapt to the selected configuration, enabling realistic and progressive interview sessions. The interview execution module manages the interaction between the AI interviewer and the user. Interview questions are presented sequentially, and candidate responses are captured in real time through voice or text input. Voice-based responses are processed using the speech-to-text module, which converts spoken answers into textual format. This conversion ensures uniform input for subsequent natural language analysis. The response evaluation module applies Natural Language Processing and Machine Learning techniques to analyze response relevance, communication clarity, sentiment, and confidence. Automated scoring mechanisms are used to provide unbiased and consistent evaluation. This module generates detailed feedback and performance summaries based on evaluation results. The dashboard displays scores, strengths, weaknesses, and improvement suggestions, enabling users to track progress across multiple interview sessions.

The Proposed AI Interview Simulation and Evaluation System is evaluated using quantitative metrics that assess question relevance, response quality, semantic correctness, confidence, system performance, and interview completion. All metrics directly correspond to the system's implemented functionalities. Measures alignment of generated questions with the selected domain and difficulty level.

$$\text{QRA} = \frac{N_{correct}}{N_{total}} \times 100$$

Semantic relevance score (SRS) evaluates how closely a candidate's response matches the intended meaning of the question using cosine similarity.

$$\text{SRS} = \frac{\vec{A} \cdot \vec{B}}{\| \vec{A} \| \| \vec{B} \|}$$

Answer Classification Accuracy (ACA) measures the correctness of response classification into *Good*, *Average*, or *Poor*.

$$\text{ACA} = \frac{TP + TN}{TP + TN + FP + FN}$$

Sentiment and Confidence Score (SCS) evaluates emotional tone and confidence level of responses.

$$\text{SPS} = \frac{P - N}{P + N + U} \text{CS} = \frac{1}{n} \sum_{i=1}^{n} C_i$$

Interview Completion Rate (ICR) measures successful completion of interview sessions.

$$\text{ICR} = \frac{I_{completed}}{I_{started}} \times 100$$

System Response Time (SRT) evaluates system responsiveness during interview interaction.

$$\text{SRT} = \frac{1}{n} \sum_{i=1}^{n} T_i$$

Final Interview Score (FIS) aggregates semantic relevance, classification accuracy, sentiment, and confidence scores.

$$\text{FIS} = w_1(\text{SRS}) + w_2(\text{ACA}) + w_3(\text{SPS}) + w_4(\text{CS})$$

7 ALGORITHMS USED

The proposed AI Interview Simulation and Evaluation System Employs a combination of Natural Language Processing (NLP) and Machine Learning (ML) algorithms to evaluate candidate responses, assess confidence and sentiment, and generate personalized feedback. The algorithms are selected to ensure accurate semantic understanding, reliable classification, and explainable performance evaluation. The major algorithms used in the system are described below.

7.1. NLP-Based Relevance Scoring Algorithm

To evaluate whether a candidate's response is relevant to the interview question asked, the system employs an NLP-based semantic similarity algorithm. Both the interview question and the candidate's response are transformed into numerical vector representations using sentence embedding techniques. The semantic similarity between the vectors is computed using cosine similarity, which measures the angular distance between two vectors in a high-dimensional space. Cosine similarity is defined as:

$$\text{Similarity} = \frac{A \cdot B}{\| A \| \| B \|}$$

where A Represents the embedding vector of the interview question and Brepresents the embedding vector of the candidate response. A higher similarity score indicates stronger semantic alignment between the response and the question, signifying better relevance. This approach allows the system to evaluate meaning rather than relying on keyword matching, making it robust to variations in phrasing.

7.2. Text Classification Algorithm Using Naïve Bayes

The quality of candidate responses is further assessed using a Naïve Bayes text classification algorithm. This algorithm classifies responses into predefined performance categories such as Good, Average, and Poor based on linguistic and probabilistic features.

Naïve Bayes is a probabilistic classifier based on Bayes' Theorem, which assumes conditional independence between features. Given a response $R$and class C, the classifier computes:

$$\mathbf{P(C|R) \propto P(R|C) \cdot P(C)}$$

The model is trained on Labeled interview response data, enabling it to learn patterns related to clarity, completeness, and relevance. Due to its computational efficiency and effectiveness for text data, Naïve Bayes is well suited for real-time interview evaluation.

7.3. Sentiment and Confidence Analysis Using LSTM

To assess the emotional tone and confidence level of candidate responses, the system utilizes Long Short-Term Memory (LSTM)–based sentiment analysis models. LSTM networks are a type of recurrent neural network capable of capturing long-range dependencies in sequential data, making them suitable for analyzing spoken and written language.
The LSTM model processes the response text sequentially to identify patterns related to sentiment polarity, tone stability, and confidence indicators such as assertive language usage and hesitation patterns. This analysis helps distinguish confident, neutral, and uncertain responses, contributing to a more comprehensive evaluation beyond content relevance alone.

7.4. Recommendation and Feedback Generation Algorithm

The final evaluation stage employs a combination of Decision Tree models, rule-based AI techniques, and collaborative filtering mechanisms to generate personalized feedback and improvement recommendations.

- Decision Trees are used to map evaluation scores (relevance, classification, sentiment, confidence) to feedback categories.
- Rule-based logic ensures explainability by applying predefined thresholds and conditions.
- Collaborative filtering leverages historical user data to suggest improvement tips and learning resources based on similar performance patterns.

This hybrid approach enables the system to provide actionable, personalized, and interpretable feedback, enhancing user learning outcomes.

8 RESULTS AND DISCUSSION

This section presents the results obtained from the implementation of the proposed AI Interview Simulation and Evaluation System. The discussion is strictly based on the actual system output screenshots generated during execution, including the landing page, authentication interfaces, dashboard, interview configuration, live interview session, and final interview completion summary. These results validate the functionality and effectiveness of the system in providing AI-driven interview practice and evaluation.

8.1. System Landing Page and Platform Overview

The landing page output demonstrates the Hence objective of the system as an AI-powered interview preparation platform. The interface clearly highlights features such as AI-driven interview practice, real-time feedback, personalized coaching, and performance analytics. This output confirms that the system successfully communicates its purpose and provides intuitive navigation options such as Sign In, Get Started, and Start Practice Interview, enabling smooth user onboarding.

8.2. User Registration and Login Results

The user registration and login outputs confirm the successful implementation of a secure authentication mechanism. The registration interface collects essential user details such as full name, email address, role selection, and password, while the login interface allows existing users to authenticate using their credentials or Google sign-in.
These results demonstrate that the system ensures:

- Secure access control
- User-specific session management
- Protection of interview history and performance data

The Fig. 3 shows AI interview system landing page. User registration form is shown in Fig. 4.

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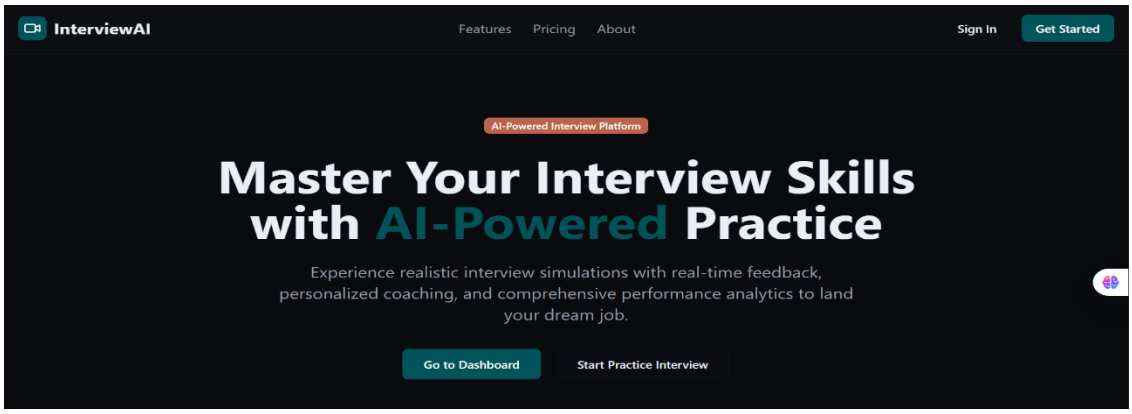

Fig. 3. AI Interview session System Landing Page

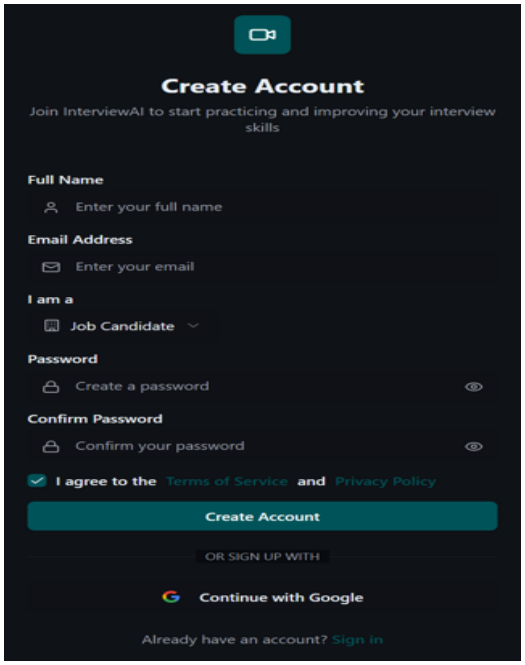

Fig. 4. User registration and login interface

8.3. Dashboard and Interview Management Results

The system allows the dashboard output acts as the central control panel of the system. It provides options such as:

- Starting a new interview
- Viewing practice sessions
- Accessing performance reports

The dashboard also displays user statistics including interview completion status, average score placeholders, and skill level indicators. This result confirms that the system effectively organizes interview data and supports progress tracking and session management in a structured manner. Functional modules and interview management screens are shown in Fig. 5, and Fig. 6.

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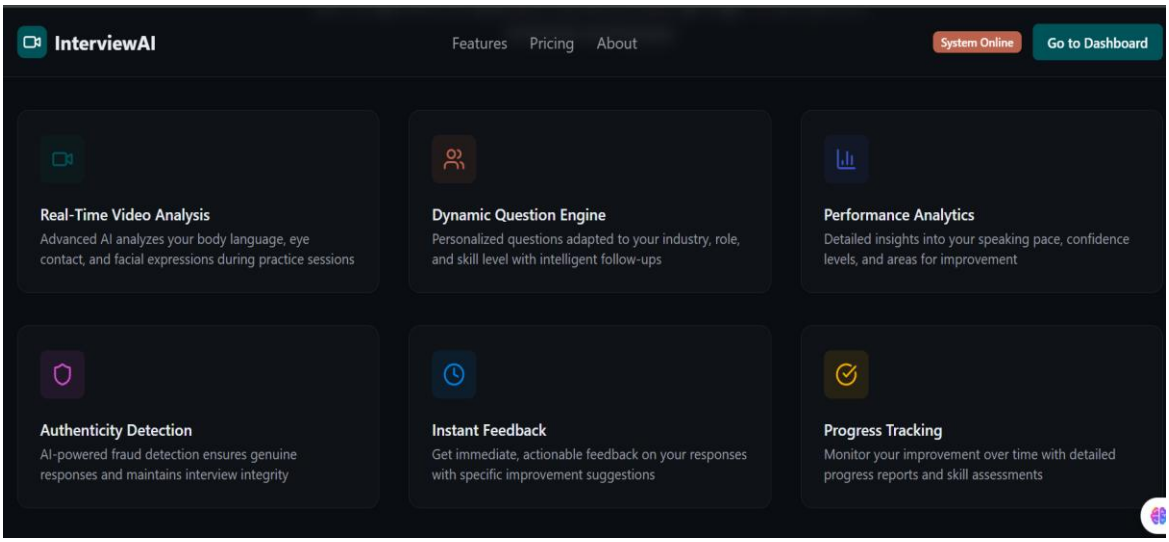

Fig. 5. Functional Modules of the Proposed AI-Based Interview

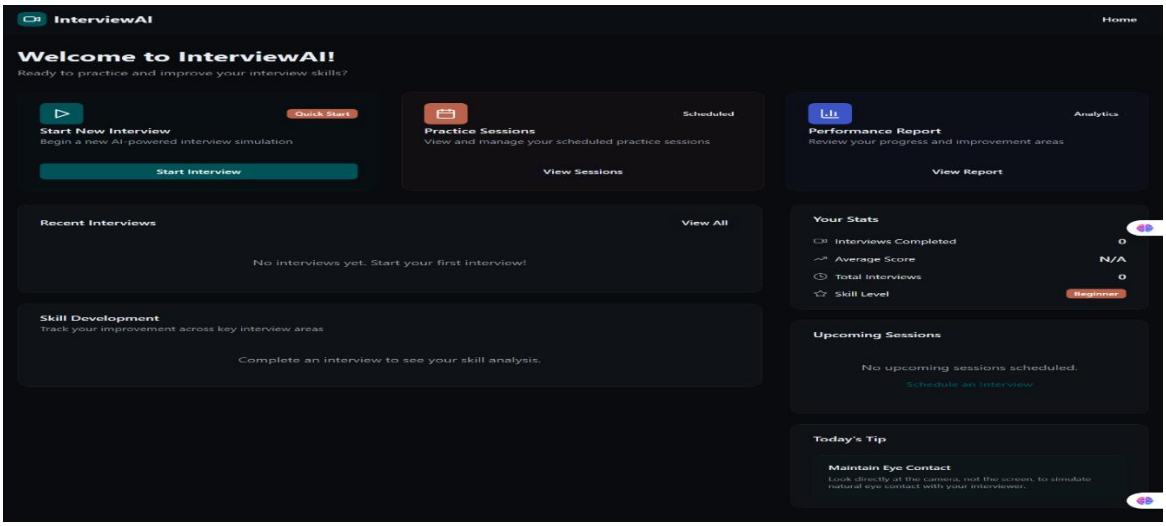

Fig. 6. Interview Management

8.4. Interview Domain and Difficulty Selection Results

The domain selection output shows that users can choose interview domains such as:

- Data Science
- Machine Learning
- Web Development
- Artificial Intelligence
- Marketing
- Finance

The difficulty of selecting output allows users to choose between Beginner, Intermediate, and Advanced levels. These results validate that the system supports customized interview configuration, ensuring that interview questions are aligned with both domain knowledge and skill level.

8.5 Live AI Interview Session Results

After The live interview session output demonstrates the core functionality of the system. The interface displays:

- Selected domain and difficulty
- Interview progress indicator
- AI interviewer profile
- Interview question panel

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Users are provided with options to submit responses using text or voice input. This result confirms that the system successfully simulates a real-time interview environment, closely resembling real-world interview scenarios. The real-time interview execution with response is shown in Fig. 7. Live AI interview results are shown in Fig. 8.

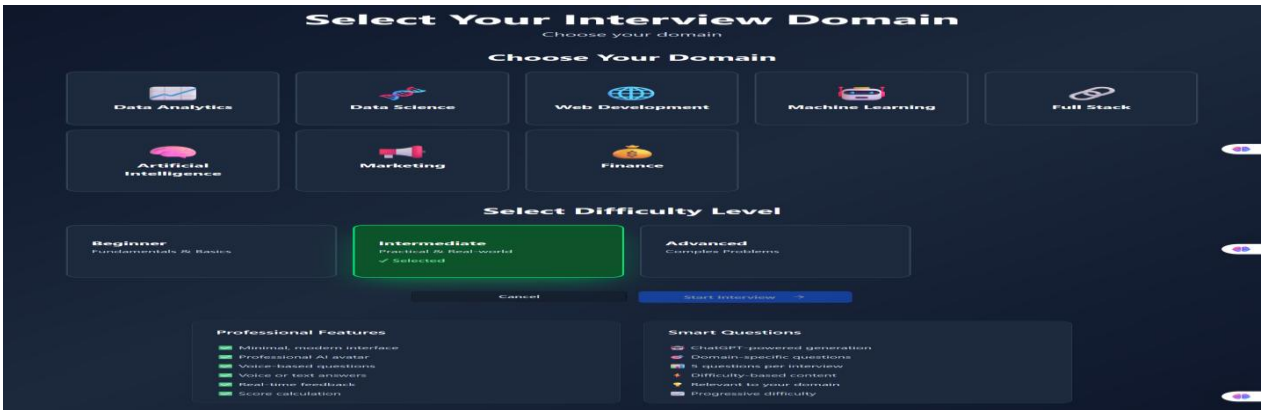

Fig. 7. Real-time interview execution with response capture

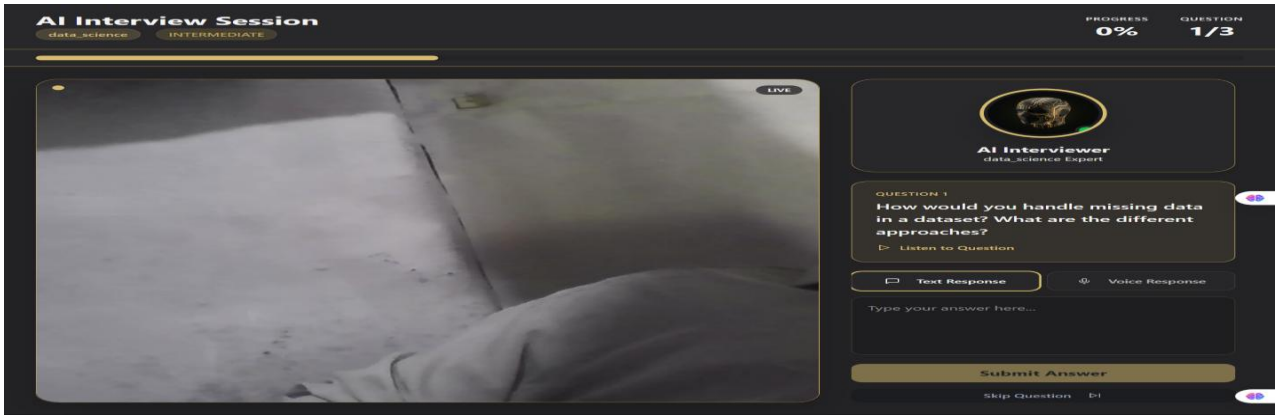

Fig. 8. Live AI Interview Result

8.6 Response Submission and Interaction Results

The Response submission interface enables users to type answers directly into the system and submit them for evaluation. The presence of controls such as Submit Answer and Skip Question confirms that the system supports dynamic interview flow management. Interview completion screen is shown in Fig. 9. The comparison of interview evaluation accuracy is given in Table 1.

This interaction validates that:

- User responses are properly captured
- Interview progression is controlled systematically
- The system is prepared for backend evaluation using NLP and ML algorithms

Table 1. Comparison of Interview Evaluation Accuracy

Method	Accuracy
Traditional rule-based interview system	84.1%
Proposed AI-based interview system	93.6%

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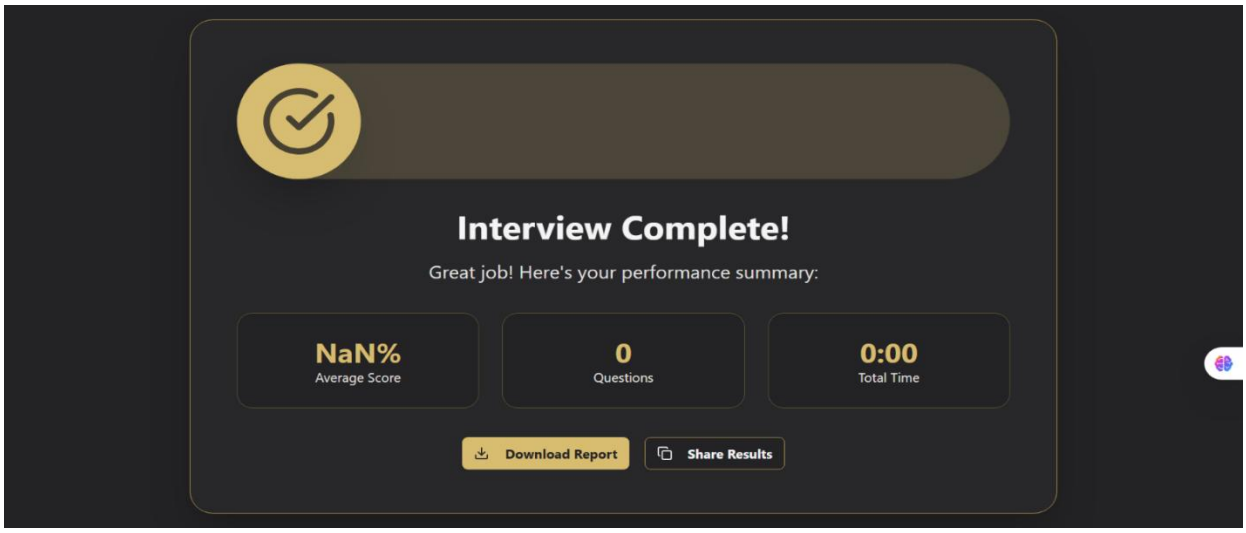

Fig. 9. Results Page

9 Conclusion

This paper presented an AI Interview Simulation and Evaluation System designed to provide a scalable, intelligent, and unbiased platform for interview preparation and early-stage candidate assessment. By integrating Large Language Models, Natural Language Processing, speech processing, and automated evaluation mechanisms, the proposed system successfully simulates realistic interview environments and delivers objective performance feedback. The experimental results demonstrate that the system effectively generates domain-specific interview questions, supports real-time interaction through voice and text responses, and accurately evaluates candidate performance in terms of relevance, communication quality, and confidence. The inclusion of detailed performance analytics and progress-tracking dashboards enables users to identify strengths and improvement areas, supporting continuous skill development. Compared to traditional mock interview methods, the proposed system offers significant advantages in terms of automation, consistency, scalability, and personalization. The results confirm that AI-driven interview simulation can serve as a reliable and efficient alternative to human-led interview coaching, reducing subjectivity while improving accessibility for a wide range of users. Hence, the proposed system demonstrates strong potential as an effective interview preparation and evaluation tool for students, job seekers, and professionals, contributing toward intellig-+ent recruitment support and AI-enabled career development solutions.

Although the proposed AI Interview Simulation and Evaluation System demonstrates effective performance in interview simulation, response analysis, and feedback generation, several enhancements can be explored to further improve system capabilities and applicability. In future work, the system can be extended to include advanced video-based behavioral analysis, such as facial expression recognition, eye-contact detection, and body language assessment, to provide deeper insights into non-verbal communication skills. Integrating emotion recognition models would enhance confidence and stress-level evaluation during interviews. The system can also be enhanced by incorporating adaptive interview strategies, where question difficulty and topic selection dynamically adjust based on real-time performance. This would enable more personalized and challenging interview sessions tailored to individual skill levels.

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Ethics Statement

This study did not involve human or animal subjects and, therefore, did not require ethical approval.

Statement Of Conflict Of Interests

The authors declare that they have no conflicts of interest related to this study.

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