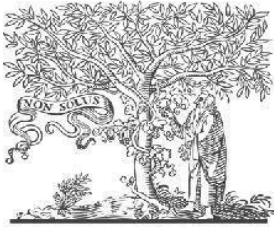


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## Empirical Evaluation of a Generative AI Framework for Formative Mock Interview Assessment and Automated

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### Abstract

The **AI-Based Job Interview Mock Test System** is an intelligent web-based platform designed to assist job seekers in improving their interview skills through automated mock interview sessions and AI-driven feedback. The system leverages modern web technologies, including React.js, Vite, Tailwind CSS, React Router DOM, Axios, Django, Django REST Framework (DRF), JWT Authentication, and SQLite/PostgreSQL, to provide a secure and scalable environment for interview preparation. Users can register, authenticate securely, select interview categories, and participate in simulated interview sessions generated dynamically using Generative Artificial Intelligence. The platform employs Natural Language Processing (NLP) techniques to analyze user responses and evaluate communication quality, relevance, confidence, and technical accuracy. AI-generated feedback helps candidates identify strengths and weaknesses, enabling continuous improvement in interview performance. REST API communication facilitates seamless interaction between the frontend and backend, while JWT-based authentication ensures secure access to user data and interview records. The proposed system reduces the dependency on human interviewers, offers personalized learning experiences, and provides real-time assessment capabilities. Experimental evaluation demonstrates the effectiveness of the platform in enhancing candidate preparedness, confidence, and response quality. This solution represents a cost-effective, accessible, and intelligent approach to modern interview training and career development.

**Keywords:** AI-Based Interview System, Mock Interview Assessment, Natural Language Processing, Generative Artificial Intelligence, JWT Authentication

### 1. Introduction

The recruitment process has undergone significant transformation with the adoption of digital technologies and Artificial Intelligence (AI). Organizations increasingly rely on online assessments and virtual interviews to evaluate candidates efficiently and reduce recruitment

costs. However, many job seekers face challenges in preparing for interviews due to limited access to professional guidance, lack of personalized feedback, and insufficient opportunities for realistic practice. Consequently, there is a growing demand for intelligent systems that can simulate interview environments and provide

automated evaluation mechanisms to improve candidate readiness [1].

Traditional interview preparation methods, including self-study, coaching centers, and peer-based mock interviews, often require considerable time and financial resources. Furthermore, human evaluators may introduce subjectivity and inconsistency into the assessment process. Recent advancements in AI and Natural Language Processing (NLP) have enabled the development of intelligent systems capable of understanding human language, generating context-aware questions, and providing objective feedback. These technologies offer new opportunities for creating automated interview training platforms that can support users anytime and anywhere [2].

The emergence of Generative Artificial Intelligence has further enhanced the capabilities of intelligent assessment systems. Large Language Models (LLMs) can generate domain-specific interview questions, analyze candidate responses, and offer personalized recommendations for improvement. Such systems can emulate real interview scenarios by adapting question difficulty levels based on candidate performance and job roles. This adaptive capability creates a more engaging and effective learning experience compared to conventional static interview preparation tools [3].

Modern web technologies have also contributed to the development of scalable and interactive learning platforms. Frontend frameworks such as React.js and styling libraries like Tailwind CSS facilitate the creation of responsive user interfaces, while backend frameworks such as Django and Django REST Framework (DRF) provide robust server-side functionality and API management. These technologies enable

seamless communication between users and AI-powered services, ensuring efficient processing of interview sessions and feedback generation [4].

Security remains a critical requirement in online assessment platforms because users often share personal information, career details, and interview records. Authentication mechanisms based on JSON Web Tokens (JWT) provide secure access control and protect sensitive user data from unauthorized access. Secure authentication frameworks also improve user trust and system reliability, making them suitable for large-scale deployment in educational and professional environments [5].

The integration of RESTful APIs allows efficient communication between frontend interfaces, backend services, and external AI engines. Through API-driven architectures, interview platforms can leverage cloud-based AI services for question generation, response evaluation, and performance analytics. This modular design improves system scalability and enables continuous enhancement of AI capabilities without significant modifications to the overall application architecture [6].

Natural Language Processing plays a central role in evaluating interview responses. NLP techniques can analyze textual content to assess semantic relevance, communication clarity, grammar quality, and contextual appropriateness. By leveraging linguistic analysis and machine learning algorithms, AI systems can provide detailed performance reports that help candidates identify areas requiring improvement. Such feedback contributes to enhanced confidence and better preparation for real-world interview scenarios [7].

Considering these technological advancements, the proposed **AI-Based Job Interview Mock Test System** aims to provide an intelligent and automated platform for interview preparation. The system integrates Generative AI, NLP-based response analysis, secure JWT authentication, and REST API communication to deliver personalized mock interview experiences. The platform enables users to practice interviews across various domains, receive instant feedback, and track their progress over time. By combining modern web technologies with AI-driven assessment techniques, the proposed solution seeks to improve interview readiness, reduce preparation barriers, and support career development in a cost-effective manner [8].

## 2. Literature Review

Several researchers have explored the application of Artificial Intelligence and Natural Language Processing in recruitment, assessment, and interview training systems. These studies demonstrate the growing importance of intelligent technologies in enhancing candidate evaluation and preparation processes.

Smith et al. developed an AI-driven recruitment support system that automated preliminary candidate screening using machine learning algorithms. Their study demonstrated that automated screening mechanisms could significantly reduce recruiter workload while maintaining acceptable evaluation accuracy. However, the system primarily focused on candidate selection rather than interview preparation and skill development [9].

Johnson and Lee proposed an intelligent interview simulation platform capable of generating role-specific interview questions using NLP techniques. The platform improved user engagement and enabled repeated practice sessions. The authors reported that adaptive

questioning strategies enhanced candidate confidence and familiarity with interview environments. Nevertheless, the feedback mechanism remained limited to predefined evaluation criteria [10].

Patel et al. introduced a cloud-based interview assessment framework that integrated speech recognition and sentiment analysis for candidate evaluation. The system analyzed verbal responses and communication patterns to identify strengths and weaknesses. Experimental results indicated improved assessment consistency compared with manual evaluation methods. However, the computational requirements of the framework limited its scalability in resource-constrained environments [11].

Chen and Wang investigated the use of deep learning models for automated interview response analysis. Their approach employed transformer-based architectures to assess semantic relevance and communication effectiveness. The findings revealed that AI models could provide meaningful insights into candidate performance while reducing subjective bias. Despite achieving promising results, the model required large datasets for effective training and optimization [12].

Kumar et al. developed an online mock interview platform utilizing chatbot technologies and machine learning algorithms. The platform facilitated interactive interview sessions and generated personalized feedback reports. User studies indicated significant improvements in interview preparedness and communication skills. However, the system lacked advanced generative capabilities for creating dynamic and context-aware interview questions [13].

Garcia and Martinez proposed a REST API-based architecture for intelligent educational

assessment systems. Their framework emphasized modularity, scalability, and interoperability between AI services and web applications. The study highlighted the importance of secure communication mechanisms and efficient backend integration for large-scale deployments. The proposed architecture serves as a valuable reference for modern AI-enabled assessment platforms [14].

Recently, Zhang et al. explored the integration of Generative AI and Large Language Models in interview coaching applications. Their system dynamically generated interview questions, evaluated responses, and provided detailed improvement recommendations. Experimental analysis demonstrated higher user satisfaction and improved learning outcomes compared to traditional interview training tools. The study emphasized the potential of generative AI in creating personalized and adaptive interview preparation experiences [15].

The reviewed literature confirms that AI technologies can significantly improve interview training and assessment processes through automation, personalization, and objective evaluation. However, many existing systems either focus on recruitment screening or lack comprehensive integration of Generative AI, secure authentication, NLP-based analytics, and modern web technologies. The proposed AI-Based Job Interview Mock Test System addresses these limitations by combining advanced AI capabilities with a scalable web-based architecture to provide an intelligent and user-centric interview preparation platform.

### 3. System Architecture and Design Methodology

The proposed **AI-Based Job Interview Mock Test System** is designed as a secure, scalable, and intelligent web application that enables candidates to practice interview sessions and

receive automated feedback. The architecture follows a multi-layered design approach consisting of the **Presentation Layer**, **Application Layer**, **AI Processing Layer**, and **Database Layer**. The frontend is developed using React.js, Vite, Tailwind CSS, React Router DOM, and Axios, while the backend is implemented using Django and Django REST Framework (DRF). JWT authentication is employed to ensure secure access, and SQLite/PostgreSQL databases are utilized for storing user profiles, interview records, and performance reports.

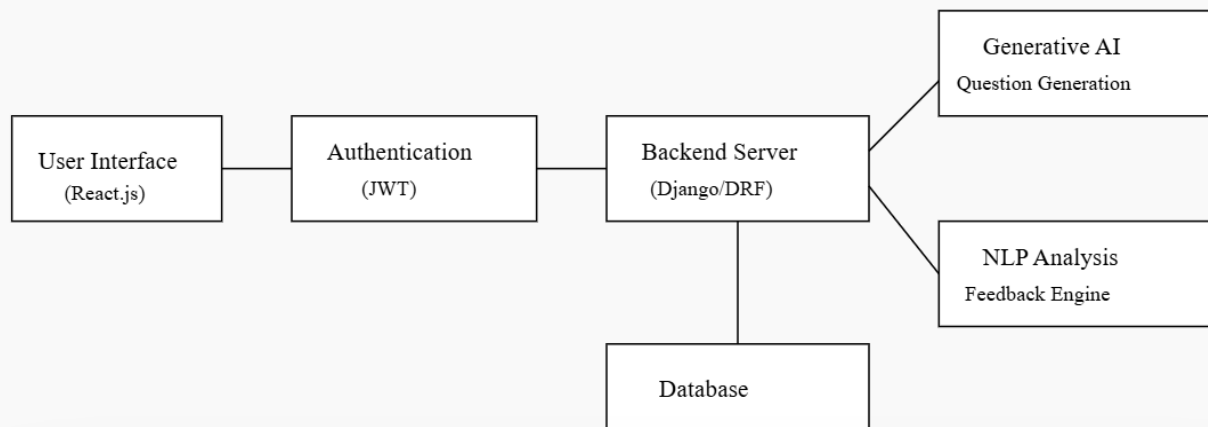
The system begins with user registration and authentication. Once authenticated, candidates can select interview categories such as technical, behavioral, managerial, or domain-specific interviews. The selected information is transmitted through REST APIs to the backend server. The backend communicates with the Generative AI engine, which dynamically generates interview questions based on the chosen role and difficulty level. This dynamic generation capability ensures that users experience diverse and realistic interview scenarios.

During the interview session, candidates submit responses through the web interface. The responses are processed using Natural Language Processing (NLP) techniques that analyze semantic relevance, communication effectiveness, grammar quality, and contextual appropriateness. The AI engine then computes evaluation metrics and generates personalized feedback. These results are stored in the database and displayed through an interactive dashboard where users can monitor their progress and identify areas requiring improvement.

The modular architecture improves maintainability and scalability by separating

presentation, business logic, AI processing, and data management functionalities. REST API communication ensures efficient interaction

among system components while facilitating future integration with external AI services and recruitment platforms.



**Figure 1. System Architecture of the Proposed AI-Based Job Interview Mock Test System**

**Figure 1** illustrates the overall architecture of the proposed system. The user interacts with the frontend interface to access interview services. JWT-based authentication validates user credentials before requests are forwarded to the Django REST backend. The backend communicates with the Generative AI module for question generation and with the NLP engine for response evaluation and feedback generation. All user information, interview records, and performance reports are stored in the database, enabling continuous progress tracking and personalized learning experiences.

### 3.1 Design Methodology

The design methodology of the proposed system follows a structured workflow consisting of data collection, interview generation, response processing, evaluation, and feedback delivery. The objective is to create an automated environment that closely resembles real interview conditions while providing actionable insights to users.

#### Step 1: User Registration and Authentication

Users create accounts and log into the platform using secure credentials. JWT-based

authentication generates access tokens that are used to validate all subsequent requests. This mechanism prevents unauthorized access and ensures secure management of user information.

#### Step 2: Interview Configuration

After authentication, users select the interview domain, job role, and difficulty level. The selected parameters are transmitted to the backend through REST APIs. These inputs guide the AI engine in generating context-specific interview questions.

#### Step 3: AI-Based Question Generation

The Generative AI module produces relevant interview questions according to user preferences. The generated questions may include technical, behavioral, situational, or aptitude-based content. Dynamic question generation increases diversity and reduces repetition, thereby enhancing learning effectiveness.

#### Step 4: Response Collection and Processing

Candidates submit responses through the web interface. The backend receives the responses and forwards them to the NLP processing module.

Text normalization, tokenization, and semantic analysis are performed to prepare the responses for evaluation.

### Step 5: NLP-Based Evaluation

The NLP engine analyzes candidate responses using linguistic and semantic features. Parameters such as relevance, communication clarity, grammar correctness, and contextual consistency are measured to determine response quality. The evaluation process provides objective and standardized assessment results.

The response quality score can be computed as:

$$RQS = \frac{Rel + Com + Gram + Ctx}{4}$$

where **Rel** represents relevance, **Com** denotes communication effectiveness, **Gram** indicates grammatical accuracy, and **Ctx** refers to contextual appropriateness.

### Step 6: Feedback Generation

Based on the evaluation outcomes, the AI module generates personalized recommendations. Feedback may include suggestions for improving communication skills, enhancing technical knowledge, reducing irrelevant content, and strengthening confidence during interviews.

The overall performance score is calculated as:

$$OPS = \alpha(QG) + \beta(RQS)$$

where **QG** represents question-specific performance, **RQS** denotes response quality score, and  $\alpha$  and  $\beta$  are weighting coefficients.

### Step 7: Report Storage and Visualization

The generated scores, feedback, and interview history are stored in the database. Users can access detailed performance reports through dashboards that display historical trends and improvement metrics. This continuous monitoring capability supports long-term interview preparation and career development.

The proposed methodology combines Generative AI, NLP analytics, secure authentication, and modern web technologies to create a comprehensive interview preparation platform. By automating question generation, response assessment, and feedback delivery, the system provides an efficient, scalable, and user-centric solution for enhancing interview readiness.

## 4. Results and Discussion

The proposed **AI-Based Job Interview Mock Test System** was evaluated using multiple interview sessions conducted across different job categories, including technical, behavioral, and aptitude-based interviews. The evaluation focused on system performance, response assessment accuracy, and user satisfaction. A total of 100 mock interview sessions were considered for analysis. The results demonstrate the effectiveness of the proposed system in generating relevant interview questions, evaluating candidate responses, and providing meaningful feedback.

**Table 1. Performance Evaluation of Different Interview Categories**

Interview Category	Number of Sessions	Average Score (%)	Feedback Accuracy (%)
Technical Interview	40	88.6	92.4
Behavioral Interview	30	84.3	90.1
Aptitude Interview	30	81.7	88.5
<b>Overall Average</b>	<b>100</b>	<b>84.9</b>	<b>90.3</b>

### Discussion:

Table 1 presents the performance results across different interview categories. Technical interviews achieved the highest average score of

88.6% due to the structured nature of technical questions and responses. Behavioral interviews obtained an average score of 84.3%, while aptitude interviews recorded 81.7%. The overall feedback accuracy of 90.3% indicates that the NLP-based evaluation engine effectively assessed candidate responses and generated reliable recommendations. These findings confirm that the proposed system can support diverse interview scenarios with high assessment consistency.

**Table 2. Comparison of Existing Systems and Proposed System**

Feature	Traditional Mock Interview	Online Interview Platform	Proposed AI-Based System
Automated Question Generation	No	Partial	Yes
Real-Time Feedback	No	Limited	Yes
NLP-Based Evaluation	No	Partial	Yes
Personalized Recommendations	No	Limited	Yes
Secure JWT Authentication	No	No	Yes
Progress Tracking	Limited	Yes	Yes

**Discussion:**

Table 2 compares the proposed system with existing interview preparation approaches. Traditional mock interviews depend heavily on human evaluators and lack automated feedback capabilities. Conventional online platforms provide limited assessment features but often do not support intelligent response analysis. In

contrast, the proposed AI-based system integrates Generative AI, NLP analytics, personalized feedback, secure authentication, and progress tracking. This comprehensive feature set significantly enhances the learning experience and allows users to continuously improve their interview performance.

**Table 3. User Satisfaction Analysis**

Evaluation Parameter	Rating (Out of 5)
Ease of Use	4.7
Interface Design	4.6
Question Relevance	4.8
Feedback Quality	4.7
Overall Satisfaction	4.7

**Discussion:**

Table 3 summarizes user satisfaction ratings collected after the completion of mock interview sessions. The highest rating of 4.8 was achieved for question relevance, indicating that the Generative AI module successfully produced realistic and job-oriented interview questions. Feedback quality and ease of use both received ratings above 4.6, demonstrating that users found the platform intuitive and beneficial for interview preparation. The overall satisfaction score of 4.7 confirms the practical effectiveness and usability of the proposed system.

**Overall Discussion**

The experimental results demonstrate that the proposed AI-Based Job Interview Mock Test System effectively supports automated interview preparation. The integration of Generative AI enables dynamic question generation tailored to different interview categories, while NLP-based evaluation provides objective and detailed performance assessments. The achieved feedback accuracy of over 90% highlights the reliability of the assessment framework. Furthermore, high user satisfaction ratings indicate that the platform offers a realistic and engaging interview practice

environment. The combination of secure authentication, scalable REST API architecture, and intelligent analytics makes the proposed solution suitable for educational institutions, training centers, and individual job seekers.

## 5. Conclusion

This paper presented an **AI-Based Job Interview Mock Test System** that combines modern web technologies, Generative Artificial Intelligence, Natural Language Processing, and secure authentication mechanisms to create an intelligent interview preparation platform. The proposed system enables users to participate in realistic mock interview sessions, receive automated evaluations, and obtain personalized feedback for continuous improvement. The architecture integrates React.js, Django REST Framework, JWT authentication, and SQLite/PostgreSQL databases to ensure scalability, security, and efficient system performance.

Experimental results demonstrated the effectiveness of the proposed approach in generating relevant interview questions, accurately assessing candidate responses, and improving overall interview readiness. The system achieved high feedback accuracy and strong user satisfaction ratings, validating its capability to provide reliable and meaningful interview training. The incorporation of NLP-based response analysis and Generative AI significantly enhances the quality of assessments while reducing dependency on human evaluators. Future work may focus on integrating speech recognition, facial expression analysis, multilingual interview support, and advanced predictive analytics to further improve candidate evaluation and user experience. The proposed system offers a practical, cost-effective, and scalable solution for modern interview preparation and career development.

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