

## Survey on Intelligent Web-Based Job Recruitment Simulation Platform

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**Abstract:** The growing competition in the international job market justifies the need for scalable, impartial, and integrated interview preparation tools. The limitation in mock interviews can be well-explained by the presence of subjective analysis, inaccessibility in terms of availability of judges/interviewers or experts, and a broader scope for assessment. To overcome these drawbacks and limitations, this study presents an AI-integrated web solution for multi-stage job simulation. These platforms will help in the development and implementation of an end-to-end recruitment process and include aptitude testing and assessment, technical assessment and interviews, managerial-level interview simulations, and HR-level interviews and analysis on a broader MLM analysis. More advanced AI methods such as natural language processing analysis, speech and voice analysis and assessment, facial expression analysis and assessment for emotion recognition, and sentiment and behavioral analysis and assessment will be integrated to help develop an unbiased system for individual feedback and assessment at each stage. The extensive analysis in the study through the study's extensive dimensions and needs identifies the fragmented platforms and indicates an emerging integrated solution for the developmental requirements of this study.

**Keywords:** AI-based Interview Simulation, Multimodal Analytics, Job Simulation Platform, Natural Language Processing, Facial Emotion Recognition, Speech and Voice Analysis, Automated Candidate Assessment, Behavioral Analysis, Recruitment Automation, Employability Enhancement

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### I. Introduction

The increasing competitiveness in the global job market has therefore increased the need for well-structured and scientifically valid personalized interview preparation aids. The conventional mock interview sessions conducted by college mates and faculty members or career counseling professionals are often plagued by issues of subjective analysis and assessment, unavailability of trainee evaluators, and a lack of scalability to handle large student populations. Most are therefore struggling to access valid and accurate feedback that can help in addressing skill development and employment readiness. The existing preparation aids also only focus on the verbal presentation aspect and fail to offer a comprehensive assessment analysis of aptitude, subject matter knowledge, presentation and behaviour personal attributes, and HRM skills.

With the advancements in the area of artificial intelligence, multimodal analytics, and natural language processing, there has been a rising interest in the application of automated interview assessment systems. Artificial intelligence has the potential to analyse the responses of the candidate, both verbal and non-verbal, with an immense amount of efficiency and effectiveness. Research has revealed that multimodal behavioral analytics, such as voice tone, facial expressions, body language, and linguistic variables, have been able to provide valuable performance insights and help the candidate in understanding how they are being judged in the interview simulation.

To overcome these classic objections, this research work proposes an AI-Assisted Multi-Stage Job Simulation Web-Based Platform for simulating an end-to-end recruitment process involving aptitude tests, technical rounds of assessment, analysis of interviews using AI, and HR rounds. The platform offers personal feedback for improvement in each area and even suggests learning resources for enhancing employment aptitude.

### II. Literature Survey

There has been considerable research work done on AI-based mock interview platforms, multimodal analytics, recruitment automation, and intelligent assessment systems. Each of these studies provides distinct insights that, together, provide a robust basis for the proposed multi-stage job simulation system.

Agrawal et al. [1] have proposed a multimodal behavioral analytics framework that aims to assess candidate performance in simulated interviews by incorporating visual, auditory, and linguistic modalities. Facial micro-expressions, gesture dynamics, tone of voice variations, and linguistic coherence were analyzed to assess key behavioral traits such as confidence, preparedness, and communication skills. The multimodal features were then used in machine learning classifiers to obtain predictive performance scores, which enabled a more objective and unbiased assessment process. The authors have clarified that the combination of multimodal features helps to greatly reduce the bias of the assessors compared to more traditional, verbal-type evaluations. In fact, the study will play a very useful role and demonstrate that by using behavioral indicators from multiple modalities, it would be much easier to interpret candidate competence and interview readiness and, most importantly, demonstrate the efficiency of a multimodal assessment framework in predicting performance in real interviews with greater accuracy.

The AI-based simulated interview evaluation tool developed by Golande et al. [2] revolves around the candidate performance analysis based on facial recognition of emotions and sentiment analysis together with speech pattern analysis. The proposed model uses CNN-based models for categorization of facial expressions based on emotional conditions like stress, confusion, confidence, and attentiveness. Along with this, there is a combination of other modules for analysis of speech based on the levels of modulation of tone, pause time, pause for hesitation, and fluency levels. The authors have emphasized that the role of emotional intelligence is extremely crucial for interview performance as it has been observed that "candidates with sound vocal tone, confident body language, and sustained eye contact have better performance compared to those with similar levels of technical skills." These observations clearly show that AI-based simulated interview analysis systems provide better performance and efficiency as well.

Additionally, the study discusses an AI-assisted mock interview training solution presented by Tejaswani K. et al. in [3]. The solution mainly concentrates on audio feedback and analyzes the answers of the applicants using the concepts of NLP. The solution works by analysing the audio answers to check them on the parameters of grammatical correctness, fluency, sentence formation, and relevance of the key words. Additionally, the solution also analyzes the audio answers in terms of the use of filler words, speaking in monotones, and inconsistency to provide a complete feedback report. Nevertheless, the solution by Tejaswani K. et al. intends to provide the remedy for the problem where the un performance in the interview lacks the knowledge but the inappropriate communication and ineffective structuring of the answers. Experimental results prove the improvement in the relevance and clarity of the answers based on the frequent practice of the NLP-based content analysis. This work proves the validity of the assumption where the improvement in the communication skills using the concepts of NLP is equally fruitful in improving the answers in the interview session.

Manthaj Jaiswal & Ayush Vashishtha [4] proposed a "pose-based interactive mock interview simulator" that aims to assess non-verbal behavioral aspects while a person prepares for an interview. In their proposed idea, they make use of pose-estimation techniques, in which body pose, hands, and face are analyzed in order to recognize behavioral aspects like slouching, excessive & irregular body movements, lack of eye contact, along with improper gesturing-which are a few of the most common aspects associated with interview anxiety. According to their proposed idea, most traditional mock interview systems lack feedback related to posture, which is one key point that greatly affects interviewee impressions in front of interviewers. It is evident from this research that their results provide strong proof that adding pose detection & body-language analysis to interview systems will have a great impact on boosting interviewee presentation skills & confidence levels.

A computerized interview assessment system that uses AI, developed by Siddhi Awasare et al. in [5], is a combination of resume parsing, generation of domain-specific interview questions, and sentiment analysis for automated candidate assessment. This proposed system identifies specific skills and qualities from a resume of a candidate and automatically prepares targeted technical interview questions based upon the candidate's level of expertise, type of job, and industry category. On the other hand, analytical models of sentiment analysis are used for judgment of candidate emotional levels based upon their answers, while technical components for assessing comprehension levels are considered for automated measurement. This proposed combination-based idea is demonstrated in [5], which states that there is a great potential for automated preliminary human resource processing procedures in these AI-based systems.

Vinothini T., et al. [6] suggested an "immersive AI-based interview simulation framework" incorporating natural language processing, facial emotion recognition, and voice modulation analysis techniques to evaluate the performance of the candidate. The proposed framework provides real-time visual analytics of the interview process through interactive dashboards highlighting various parameters like emotional changes, confidence levels, and speech anomalies in the candidate's performance during the interview process. The study aptly proves the increased learning efficiency provided by the availability of real-time visual analytics capabilities of the system by allowing the candidate to address the behavioral aspects in real time during the process instead of after the completion of the interview session.

Dr. Radha Shirbhate et al. [7] also investigated a multimodal interview evaluation framework, combining speech-to-text processing, pose estimation, and sentiment analysis for a holistic evaluation of verbal and non-verbal aspects of candidate performance during the interview process. The proposal follows the simultaneous monitoring of verbal qualities such as tone of voice variation and hesitation instances with stress patterns in the face and non-verbal indicators of candidate posture for the revelation of underlying stress and inadequacies in candidate communication during the interview process. The proposal indicates the efficacy of computer vision and speech processing for accurate behavioral pattern recognition for confident candidates as opposed to nervous or insufficiently prepared ones during interviews based on advanced computer vision and speech processing capacities for robust pattern recognition with high accuracy.

Suguna M. et al. in [8] investigated the decision support algorithms powered by AI, used in auto-recruitment systems, to aid the recruiter in deciding the ranking of the candidate. The authors designed an innovative predictive recruitment system by combining the classification algorithm using machine learning with the scoring procedure based on the behaviour of the candidate. The authors designed the system using various parameters like linguistic sentiment features, Facial Expression Clustering Features, as well as features derived from the psycholinguistics of the candidate’s speech transcript. The experiment performed indicated the improvement in the accuracy level of candidate ranking by 35% by using the combined linguistic-emotional features in contrast to the manual procedure followed in the traditional evaluation process. The authors also clarified the limitations of using AI systems in decision-making capabilities by establishing the necessity to complement it with the capabilities of the human mind in the decision-making process, especially while building the ethical platform for the simulation process in the recruitment procedure.

Authors Dadaboyev et al. [9] attempted to give a detailed overview of the AI recruitment ecosystem, with special emphasis on their benefits as well as risks involved. The authors discussed that there is immense benefit for recruitment processes due to AI as it results in greater efficiency of recruitment processes. In fact, AI recruitment systems show improving efficiency of recruitment process activities by improving screening time and ensuring greater consistency of recruitment decision-making. At this point, it becomes crucial to interpret the risks involved with AI recruitment systems as discussed by Dadaboyev et al. [9], which include lack of transparency of decision-making processes. In fact, there may be risks of engraving further biases against candidates based upon unbalanced and biased dataset development.

Dhinakaran Thangaraj et al. [10] highlighted an AI-assisted assistive system primarily concentrating on assistive technology itself. The technology addressed complex methods of multimodal processing, such as tactile pattern recognition, text to Braille translation, and adaptive feedback. Although it did not relate to assessment in an interview setting directly, this article holds extremely valuable ideas from its design perspectives, which relate to inclusive AI-assisted training system designs. The authors primarily emphasized core features such as low power usage, modularity in system design, and proper synchronization of multisensory modalities to improve usability and robustness. Design perspectives of this article add immensely to building interview simulation software that allows users of different kinds of accessibility to interact with it. The article gives a robust message of using multisensory AI frameworks in practical assistive technology applications rather than merely in concept demonstration software, thus establishing fair and inclusive digital assessment platforms.

### III. Gap Analysis Chart

Reference Number	Multimodal Analysis	AI-based Interview Systems	Facial Emotion Recognition	Speech/ Voice Analysis	Sentiment/ Emotional Analysis	Machine Learning Models	Pose/Body Language Analysis	Automated Candidate Evaluation	Psycholinguistic Feature Analysis
[1]	*	*	*	*		*			
[2]		*	*	*	*	*			
[3]				*					
[4]							*		
[5]		*			*			*	
[6]		*	*	*					
[7]	*	*	*	*	*		*		
[8]		*	*	*	*	*		*	*
[9]								*	
[10]	*								

### IV. Gap Analysis

The gap analysis chart allows for a tabulated comparison of ten research works in the area of AI-based interview systems and highlights the coverage and weight of the analytical techniques within the existing literature. The most imminent observation that comes from the chart is that speech and voice analysis appears as the most frequently adopted modality, being found in the majority of references. This points out that the researchers tend to focus more on vocal attributes, such as tone, fluency, hesitation, and modulation, as the main indicators of interview performance. Similarly, AI-based interview systems and facial emotion recognition also

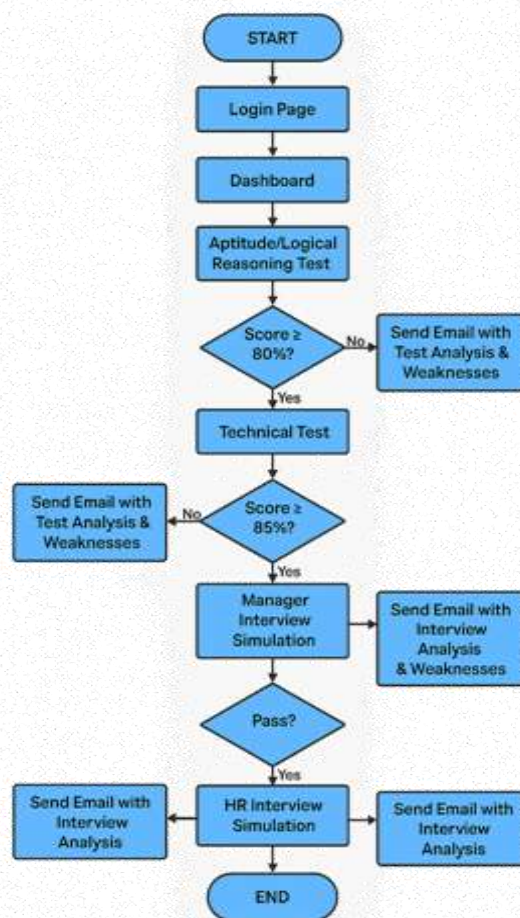
happen to be extensively represented, which suggests that most studies recognize the importance of automation in interview assessment and capture of emotional cues by computer vision techniques.

Nevertheless, it can be observed that, along with the above-mentioned advantages, the involvement of multimodal analysis, incorporating various streams of data such as speech, facial expressions, posture, and linguistic patterns, although restricted to a few references, is portrayed in this chart. It implies that the majority of references are conditioned on isolated modalities instead of an encompassing paradigm that can conduct a thorough evaluation of candidates. The same pattern can be identified for machine learning models as well, restricted to a few references only.

The study also reveals that the analysis of sentiment and emotion, although extremely important for the analysis of confidence, stress, and emotional stability of the candidate, is not uniformly taken into consideration. More glaringly, the evaluation of pose and body language analysis is considered only by a few references, indicating a considerable research gap regarding the assessment of non-verbal behavioral indicators that have a significantly substantive influence on interviewee perception. The psycholinguistic feature analysis is the least investigated aspect, as it is mentioned only by one reference.

Moreover, very little existing work focuses on the evaluation of the candidates automatically, which serves as the foundation for totally automating the support process throughout the entire recruitment procedure. Additionally, it can be noticed from this chart that the literature portrays a very patchy research area in which either speech, emotion, or posture is researched individually. It can be concluded from the chart above as well as from the literature related to the concerned topic that the incomplete systems imply a very clear research gap. The future study should aim at developing well-integrated platforms using artificial intelligence in the simulation of the interview process of the candidate incorporating multimodal sensing systems along with machine learning systems while also including the concept of ethics in the study related to the concerned topic.

### V. Proposed Methodology



The system will adopt an AI-aided job simulation approach in a multi-stage process to assess the suitability of the candidates based on aptitude tests and interviews, incorporating several programming languages in each stage of the implementation process. The login module starts with a login security module,

implemented by HTML/CSS/JS and React.js for the frontend, and authentication and user management implemented on the backend by Java Spring Boot. The login functionality is implemented for secure access and sound communication for the user interface and backend through RESTful API design.

Once a login is accomplished, a dashboard would have been created for the individual to be redirected to through React.js and TypeScript; this is for viewing test stages, tracking, and analyses for performance. The test level would also have a starting name that is known by aptitude and logical reasoning tests. Q & A features and responses to those answers are handled by scripts written using Java (Spring Boot), while analyses are performed by scripts written by Python. The candidates who meet the requirements will then undergo the Technical Test where technical issues will be presented to the frontend through JavaScript/React.js and will be judged through Java on the backend. The logic of autoscoreing and execution of skills will be addressed through Python.

The simulation of the Managerial Interview stage of this system uses AI modules in Python for speech recognition, sentiment analysis, and behavioral analysis, and React.js for simulating the interface of these interviews, and REST APIs in Spring Boot for sending voice and text information. In the Final HR Interview simulation, sophisticated python-based models are applied for communication clarity, emotional stability, and professional attitude through NLP. The simulation results are further stored in a MySQL database with the help of SQL, along with performance reports.

Each time a decision is made, automated emails with test analysis and weaknesses are triggered through backend services implemented using Java Spring Boot. The methodology is multilanguage and ensures scalability, and it is close to a real-world scenario of the recruitment process with an AI evaluation framework.

## **VI. Conclusion**

The proposed AI-based multi-stage job simulation system clearly depicts a holistic and systematic approach towards improvement in employability among students by simulating the entire recruitment process. Unlike other systems that focus on selected aspects of interview preparation, this proposed simulation system combines aptitude assessment, technical assessment, AI-based interview simulation, and behavioral assessment at the HR level into a single dynamic system. It is accomplished through highly advanced AI-based technologies like NL processing, facial recognition, sentiment detection, and automated result generation. These features ensure objective, unbiased, personalized feedback, exactly identical to the requirements of actual recruitment.

The automated mail process along with comprehensive performance analysis and development suggestions enables the candidates to analyse their strengths and work on development areas. This helps in development and leads to less reliance on human analysis for development purposes. The modularity of the system makes it scalable and appropriate for university-level trainings and placement centres as well as personal development.

On the whole, this system fills a void in the existing technologies that prepare individuals for job interviews and provides a learning and effective solution for individuals to prepare for a competitive job market environment. It boosts confidence and improves communicative skills for long-term career preparation.

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