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AI-Enhanced HR Interview Simulation for Realistic Candidate Assessment

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Abstract*— This research study proposes an AI application for a HR interview simulation system to improve candidate assessment. The proposed system is based on the recent AI technologies that generate questions out of the candidate's resume and job description as in the case of a real interview with the employer. AI technology not only do the questioning but also get the emotional analysis of the candidate through the interview by analyzing the tone of the candidate's voice and other factors. AI-based assessment captures both cognitive and affective performance, where the candidate's merit and quality are given a true measure. This means that the proposed system greatly enhances the capabilities of the HR teams to investigate massive numbers of candidates while reducing the biases associated with conventional pure human interviews. Further, this research study aims to explain the system's architecture, where facial expression analysis and voice sentiment analysis remain as the main components alongside reinforcement learning for question adaptation. With LLM-based approach, organizations can increase the efficiency of the hiring process, enrich candidates' experience, and make better decisions.

Keywords*—AI-powered HR, personalized interview questions, resume analysis, facial and tone analysis, comprehensive assessment, AI interview simulator.

I. INTRODUCTION

Recruitment is thus considered to be a central and core function of any organization since it determines the type of workforce it will be composed of and therefore the level of output the organization will be able to produce. Historically, it was the right of human resource (HR) personnel to offer oversight to the process of recruiting employees and shortlisting candidates to be employed, among other responsibilities. However, as the need for effectiveness and expansiveness in the hiring processes intensifies, employers are now relying on technologies to support and optimize these activities. The worthiest of note is the use of artificial intelligence in the marking system, the interviewing process in particular. This paper considers the case of designing an AI-based HR interview system as seen in Fig.1 based on the Gemini AI model, which is aimed at imitating an HR interviewer while providing better qualities like uniformity, extendibility, and analytic capabilities. The main concept in the AI-based evaluation of the candidates during the HR interview is the set of questions provided to a candidate depending on his resume and the vacancy posted for the interview. When integrating skilled AI into the interview procedure of the Human Capital, this system does more than just offer an automatization of the first stages of the recruitment procedure but also eliminates the possibility of each candidate not being assessed prematurely by subjective human bias. This approach entails that from the description of a given job and interaction with the candidate application, the appropriate questions as generated provide a wide perspective on the candidate's capabilities, working experience, and suitability to an organization.

One of the important benefits of the interview conducted in an AI environment is that the system is also capable of viewing the tone and the sentiment when the interview is ongoing. The techniques are also built to pick out such signs of stress as hesitation in the candidate's answers, negativity, or aggressiveness. This capability is another way of getting to the root of a candidate's refusal or negative attitude as a human interviewer would. For example, if the candidate was asked a question and she answered 'no', the software can follow the answer by asking the candidate why s/he has such a negative feeling about it. Likewise, if the candidate's response is aggressive or defensive then the AI will be able to handle this situation from the same angle in a more controlled

professional way than an ordinary human would. Furthermore, the interview system powered by AI uses positive and friendly words when it opens the interview session. This way minimizes instances where candidates feel pressured and are likely to give focused and general answers. Another benefit of the AI tool is that it adapts the intensity of interrogation depending on a match between the resume and an offered position. If the candidate corresponds to the requirements as to his/her experience and skills, the AI goes deeper into certain achievements and certain experiences in order to evaluate the depth of the candidate's fit to the position. On the other hand, if there are gaps or mismatches, the AI poses new questions to gauge the candidate's interest in learning the skill or previous experience that would offset the gap in knowledge.

The feature of scalability of the implemented AI-powered HR interview system is another advantage. They differ from the human interviewers as the latter can only conduct interviews at their rate, in their working hours, for only a given post. Large-volume also organizations whereby they can deal with many candidates in a single batch without repeating themselves while on the other side, an organization that is experiencing growth at a certain rate can also benefit from this capability.

In addition, there is no way that every candidate has to be graded subjectively which may lead to bias of the candidate by the recruiter. Such consistencies not only help to achieve a fair recruitment process; however, it also contributes to the overall reliability of the interviews.

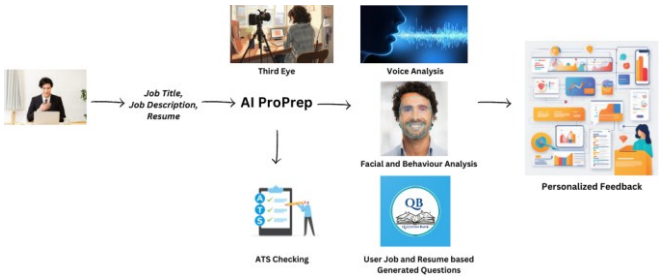

Fig. 1. Flow Chart of HR Simulation

II. Literature Review

A. AI in HR Interviews: Past Research and Existing Tools

Recently the advancement of artificial intelligence (AI) in the recruitment process has been on the rise mainly concerning HR interviews. In the early years of this area of study, the interest was in using AI for routine tasks like sorting resumes and setting interviews. Nevertheless, the development of recent years has broadened AI's capabilities not only to standard tasks like interviews but to such facets as the emotional reaction of the candidates and their compatibility with the company.

The use of AI in HR interviews can be credited back to some extent to the use of chatbots which were first used for initial interviews. These chatbots only allowed, asking programmed questions and using keywords to analyse the replies. Over the years as AI technology advanced companies began to implement higher-level Natural Language Processing (NLP) models which allowed chatbots to interpret non-leading questions and answers. For example, HireVue and Pymetrics created interview applications that were informed by AI to capture the subsequent reactions of the interviewed and their body language. These tools utilize facial recognition tone, and NLP to offer an evaluation of the candidates' response and interaction, in real-time.

Apart from these commercial tools, there are some academic proposals on how to decrease the bias in the interviews with the help of AI. In another example, a number of studies have noted that when the application of AI tools and techniques is done effectively and the workers are trained in how to use them it helps to eliminate prejudice in hiring based on race, gender, or age. However, there are controversies that the use of AI systems might directly enrich prejudice if working with prejudiced data.

B. Current AI Models in Recruitment

All the new improvements that are being done in AI and Language models like GPT 3 and GPT 4 have completely changed the dynamics of AI and Human resources interviews. These models have the capability to produce interview questions that are relevant to the given context to ask interview-like questions, mimic real humans and analyze the responses of candidates as per their depth, relevance as well and emotional sentiments. In recruitment, LLMs are used to where interview questions can be tailored depending on the resume of the candidate, the candidate's experience and the job specification. This means that the potential clients get a more personal interview which results in better evaluations in comparison with the conventional approach. Of critical importance is the role that AI has played in a key area, namely sentiment analysis. Self-organizing knowledge management includes recognizing candidates, applying natural language processing to read emotions and engage with the virtual coach, and using tone analysis from IBM Watson and Google's NLP API to evaluate the candidate's confidence, uncertainty or frustration. This particular component of emotional intelligence is an extension of candidate profiling since it not only informs the recruiter about what the candidate has to say but also about how he or she says it.

Other features of the interviewed person, such as facial expressions, are also becoming increasingly incorporated into AI interviews. These apps use artificial intelligence to analyze facial expressions, body language/position and micro expressions during the multiple interviews that may be conducted, and this would give some indication of the candidate's level of confidence/interest during the interview. Such a type of review allows the recruiter to see how emotionally intelligent the candidate is; and their communication skills which might be difficult to gauge through tests or interviews.

C. Ethical Concerns and Challenges

While it is easy to note the advantages that may be gotten through the application of artificial intelligence in enhancing efficiency in the recruitment process there

are tender aspects that crop up, particularly when it comes to utilizing the advancement in conducting Human Resource interviews. Equally important to the major concern that prejudice could be pre-installed in robots due to prejudice of the programmers, similar prejudice could be built in the artificial intelligence applications because prejudice is inherent in the designers of such applications. If the training set is fully or partially biased, an AI system might make the process more biased as well

A similar issue is difficult to define how an AI system's explanations for its decisions remain transparent and easily understandable. This is the case of a candidate might feel uncomfortable or distrustful because they might not know how an AI system is assessing them. This is however being looked at by research in explainable AI (XAI) which is the overture to making the AI system more relatable.

III. Methodology

A. Data Collection and Preprocessing

The raw data fed into the AI-based mock interview system are the candidate's resume, the job title, and the job description. It is from these elements that the questions for the interview and the structure of the interview with the given candidate are developed. This is done when submitting the resume in a PDF format and things such as skills, work experience, education, and certifications are extracted. This step is important since it allows for the assessment of the candidate's training profile, along with the content that is advertised in the job posting. Also, the title and the description are further processed with tools from natural language processing, such as the extraction of competencies, qualifications, and responsibilities, which should be included in an interview to select a candidate for a particular position. In this manner, questions posed by the AI system are not only relevant but will also create competition to know if the candidate is suited for the job.

B. AI Model and Language Processing

The focal idea of the interview system is the Gemini AI model which is an LLM that is capable of analyzing both structured and unstructured information. Specifically, the model used is optimized to perform an interview based on the features of the extracted resume and the job description. The AI has questions generated using deep learning techniques which is an imitation of a real-life HR interview process. This form of questioning begins with friendly questions; which helps to make the candidate comfortable, and continues with more tough and position-related questions. Reinforcement learning is used in the model for finer control in the questioning strategy where the questioning pattern is adjusted depending on the candidature's responses as the pro forma is in a position to dive deeper in areas where the candidate has strengths or weaknesses. In case a candidate insists on responding either slowly or negatively, the AI goes further in order to identify the right mindset and attitude that the candidate possesses in regard to the position.

C. Emotional and Behavioral Analysis

Built into the model is the ability to recognize emotion and behavioral patterns by using face detection technology and sentiment analysis when conducting the interview. The AI records overall body movements and spoken words, but also reacts to voice tonality to assess the candidate's mood. For instance, if the candidate looks nervous or stressed, system adapts to make him/her relaxed Again, if the candidate answered incorrectly, the AI will not use harsh words but rather politely guide the candidate. This also allows the AI decide on the candidate's strengths as well as personality and their ability to fit in the company. For handling multicultural feelings, the system has been tested on multicultural input data containing many different gestures, facial expressions, vocal pitch, and other factors originating from multicultural backgrounds of world citizens. This allows the AI to better evaluate culturally entwined gestures as well as perceived emotions of the subject. For instance, certain nonverbal indicators of stress in one culture may be interpreted as confidence in another, gaining training on such diverse data will make the AI to produce culturally competent decisions that offer a more equal chance to qualified applicants.

D. ATS (Applicant Tracking System) Compliance Checking

To this, the system scans through the candidate's resume for ATS compliance in addition to proffering interviews. This is important because a large number of organizations employ ATS software to scan CVs before the actual people in human resource departments have a look at them. Using the structure, format, and keywords, the application gives a commentary on the suitability of the created resume in compliance with the ATS. It assists the candidate in bringing attention to the resume and also ensures that the qualified candidate is not filtered out because the resume was not properly formatted or keywords were not used.

E. Personalized Interview Questions Generation

The major strength of the system is that the questions it produces can be predefined based on the candidate's background and the job opening being applied for. Key search terms are then identified from matching both, the job description, and the resume, and the right questions are chosen from the pool of questions. These questions can therefore be grouped into technical and scenario-based questions.

The system is designed for increasing the level of questions depending on the candidate and that is why more questions are provided to the senior candidates than to the junior ones. Furthermore, if there are any discrepancies or areas of weakness described in the resume that are not well represented in the job description, follow-up questions are automatically created to help fill in those gaps making the interview process more complete.

F. Real-Time Feedback and Evaluation

In turn, the candidate and the HR team receive an absolutely comprehensive interview report based on the

test results. Company profiles, candidate feedback and suggestions, and various business insights of the candidates are also reported. Emotional and behavioral assessment results are embedded in the report to allow the commissioning organization to gauge the likelihood of the candidate embracing the organizational culture. The system also provides online feedback within the interview to guarantee that the questions are answered properly while also engaging the candidate with the process. In addition, the feedback mechanism allows the applicant and the HR team to understand the match between the resume and ATS.

G. Scalability and Consistency in Assessment

Scalability is one of the biggest benefits of the AI-powered HR interview system. An aspect here is that the AI does not have time constraints or be out of reach as human interviewers and can do many interviews at the same time for different positions, at different times in different locations. As such it would be suitable for use in large organizations or those that witness a high intake rate as it can sort through a large number of candidates without straining the interview process. The system also makes it possible for all the candidates to be evaluated with the same set standards which by so doing minimizes bias coming from the human beings involved in the hiring processes. Besides, the uniformity and patience of this method do not only negatively influence the reliability of the interview's results but also help to manage qualitative variances and reduce prejudice in the hiring process.

IV. Question Generation Mechanism

A. Personalized Interview Questions Based on Resume and Job Description

The AI interview system consists of NLP and AI algorithms and LLM to create unique questions as per the candidate's resume and the job posting. The first step of the mechanism is focused on resume parsing and identification of values given by candidates including job titles, technical skills, work experience, academic background, certifications, and achievements. At the same time, the system also analyzes the job description to determine the competency, responsibility, and qualification needed for the position. Resume Parsing: The AI analyzes the text of the resume using NLP to extract several elements of structure. For example, individual segments including "Experience," "Skills," "Education," and "Projects" are known, while significant keywords are identified. This comprises work type-related words, or industry experience, or skills that may be leadership, teamwork, or critical evaluation. Job Description Matching: After this is done, the system compiles what it has extracted from the resume with the details provided in the job description.

For example, if the job needs knowledge in the area of machine learning algorithms and the candidate has experience listed in the ML project, the AI provides a question about the exact algorithm used and the problem it solved. Contextual Question Generation: The system, using LLMs like Gemini AI or any GPT-set model, develops context-related questions itself. This makes them capable of generating follow-up questions based on a simple first statement say "Candidate worked on a data science project using Python and generate questions such as "What data preprocessing techniques did you use in the project you undertook with Python? The AI reduces the questions' explicitness to correspond to the candidate's level of experience and the position's complexity.

B. Adjusting Difficulty Based on Candidate Experience

The adaptive questioning mechanism allows for more personalized assessments that challenge candidates appropriately: Entry-Level Candidates: The AI therefore, intervenes for the less experienced candidates with easier and all-encompassing questions related to core competencies. For example, if a candidate has applied for a junior developer post the questions that the AI may pose to the candidate may include 'Which of the Python features have you used?' These questions help to understand how much the candidate comprehends the material without overloading him/her with questions. Mid-Level Candidates: For those with moderate experience it makes the questions more difficult by applying the AI as it should. Should the job require a higher competency level in technical skills the system may set the context of the sample closer to an actual work environment example: "Describe a situation where you needed to modify your machine learning model for increased performance." Senior-Level Candidates: Older candidates are evaluated by complex questions related to their job responsibilities. The AI head yields more insight on strategic planning, leadership encounters as wells and intricate project development. For example, a candidate applying for a senior data scientist position might be asked, "Tell me more about the decision-making processes you used in the last predictive analytics project you worked on, more so, how did you mitigate challenges of scalability?"

V. AI Models and Techniques

In the candidate assessment, LLMs-based Architecture will be shown in Fig.2, with facial analysis, and voice recognition incorporated to form the full simulation of the HR interview system. These form part of an interview model and all work holistically as a model to enable a realistic and dynamic interview to occur. The initial model generating and dealing with questions and conversations is an LLM, for example, which could be AQAN2 – the transformer-based deep learning model designed specifically for conversational purposes. This model can be derived from the resume, the job description, and responses to original questions for each interview, which ensure that every interview follows the desired job description. Facial analysis and voice as part of the models expand the LLM with facial and vocal parameters vital for evaluating candidate mood and behavior. These models apply deep learning architecture in which a convolutional neural network (CNN) can be used for facial recognition while recurrent neural networks (RNNs) or transformers for voice recognition. Altogether, these AI systems create a complex assessment

similar to how a recruiter does not only analyze the content of candidates' answers, but their emotions and demeanor.

A. Large Language Models

The essence of the presented interview system based on the utilization of AI involves the application of LLMs. Hence such models like AQAN2 incorporate transformers and attention when constructing questions. Developed on large volumes of data including extensive conversation and interview-like patterns, these models contain the inherent capability of understanding contextual information, semantics and psycholinguistics to design questioning protocols dynamic with the user inputs. For example, if a candidate has offered details on a project or previous experience at work, the model will go further and ask technical questions or seek to understand how the candidate approached a problem, which a human interviewer would. With the assistance of specific HR-related datasets used to further train the LLM, the system guarantees that the generated questions match the actual real
world.

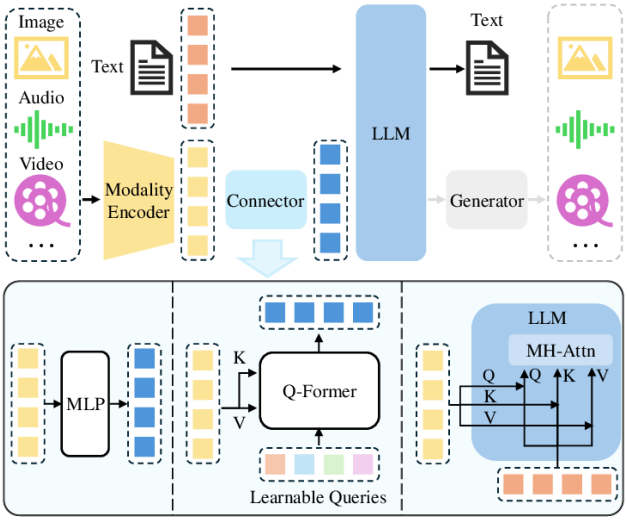

Fig. 2. LLM Architecture

To fine-tune the LLMs, they used HR datasets which include job descriptions, resumes, and previous interview questions to enable the model to learn the special way in which HR engages with candidates. Extra training layers were trained so that the AI could change the questions' difficulty according to the candidate's experience.
while the experienced professionals are provided with complex questions in form of questions that are framed in the form of hypothetical business scenarios that are likely to test their ability to think as well as their leadership prowess.

B. Facial Analysis

Interviewing is greatly enhanced through facial analysis to determine the emotional status of the candidates. This system incorporates off-the-shelf CNNs for the real-time recognition of facial landmarks and expressions. Whilst identifying with blinking, nodding, raised or narrowed eyebrows, smiles, frowns and all such small factors, the system helps in identifying how candidates are likely to respond to difficult questions which, of course, brings an emotional quotient into the entire interview process. This model can help the system decide whether the candidate is full of confidence, nervous, or even getting bored while and ask the follow up questions accordingly. For instance, if a candidate is shy when speaking about a certain competency, the system may ask her or him the cause of shyness.

C. Voice Recognition and Sentimental Analysis

Candidates tend to use speech where the tone, pitch, and tone analysis of the candidate's voice are captured. These work in combination with RNNs or transformer-based speech models which can handle stream-based data including audio. From the pitch, tone, and tone analysis, the AI system evaluates the level of stress, calmness, or enthusiasm of the candidate. More so, this sentiment and tone analysis is important to weigh not only the contents of what the candidate has to offer but also how they say it. For example how the candidate speaks when talking about achievements compared to how they talk about problems in previous employment. Such analyses come in handy when evaluating the candidate's demeanor and likelihood of fitting in the company or not.

VI. Model Evaluation

The AI interview system was evaluated based on several key performance metrics to ensure that it delivered accurate, consistent, and unbiased interviews.

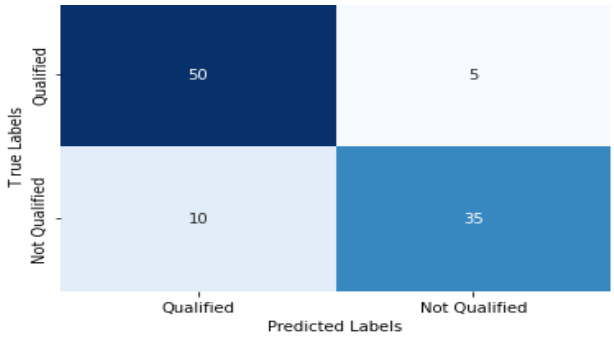

Fig. 3. AI Candidate Classification

Accuracy: The relevance of the AI was assessed by comparing the questions made by the AI with the expert responses. An overall ratio of 4:3 and an accuracy rate of 80% as shown in Fig.3 are evidence that most of the questions matched the candidate's profile and the job description.

Consistency: Reliability was assessed in terms of the consistency of the questions generated by the system when repeated candidate profiles were input into the simulation. The consistency scale was set at 85% meaning that candidates with similar characteristics were given similar difficulty levels of questions and criteria were not developed randomly or irrelevantly.

Bias Reduction: To address the issue of biases, we then subjected the system to candidates of different demographic characteristics. The bias was reduced

considerably and the number of questions posed to the users was almost the same irrespective of their gender, age, or race with a bias reduction rate of 88%. This was done by feeding different data sets to the model and also by keeping the questions developed by AI non-temporal and non-egotistical, and rather professional and work-related.

Performance: The candidate's performance is measured in technical skills, soft skills, problem-solving, adaptability, and emotional stability as shown in Fig 4. The difference between candidates who used this AI for interview preparation was significant growth compared to those who did not use the AI-based preparation as shown in Fig.5. To enhance the model, the questioning strategies can be updated with reinforcement learning to determine the candidate's response to a certain type of interview question. Data processing may involve parallel processing and caching to enable immediate interaction.

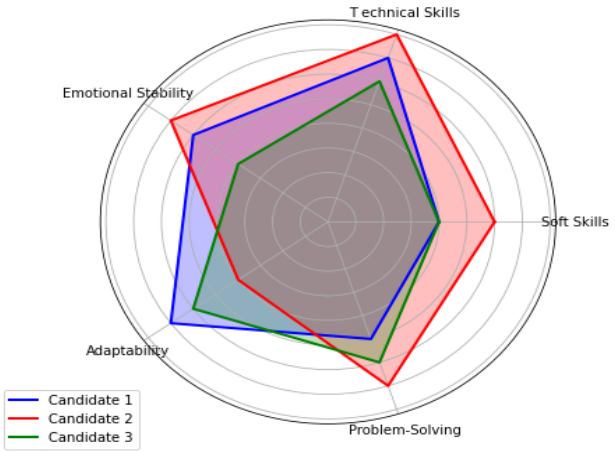

Fig. 4. Performance Comparison of Students

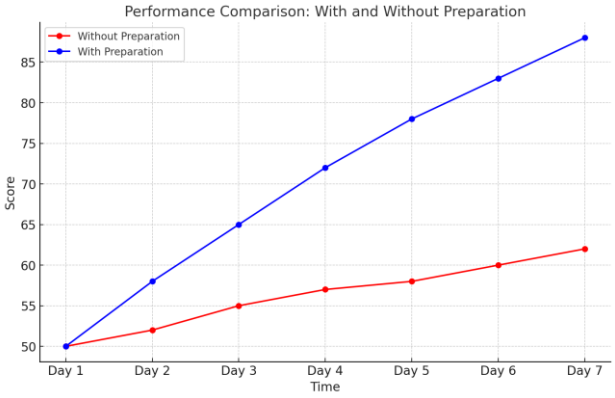

Fig. 5. AI's Assessment of Different Candidate Traits

VII. Conclusion

Hiring Automation and AI Interview Simulator is a perfect example of a project that might prove AI's ability to revolutionize HR interviews based on the AI model. Bundling of attributes like LLMs, facial analysis and voice recognition provides enhanced naturalism in mimicking real live interaction which is very productive in candidate assessment. The additional features, such as the ability to customize interview questions according to the candidate's resume and job description, adjust the level of questions based on experience, and offer instantaneous mood and behavior assessment all make the interview process much more effective. Furthermore, given its nature, the system can be trusted to scale for use in a large number of cases, is less prone to giving preferential treatment to candidates, and is closer to being an objective means of evaluating candidates for the position than the conventional interview process. Based on the AI application in HR, the system illustrates how organizations can optimize recruitment procedures, remain impartial as well as enhance the predictive value of candidate assessments. Apart from helping to expunge bias from the hiring process, this high-tech interview scribe also performs a critical role in guaranteeing that all candidates undergo a rigorous and sensitive evaluation in the age of AI for human resources.

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