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Cognitive Interview Response Evaluation Neural Framework

Prof. Gajanan Gaikwad[1], Rohini G. Bendre[2], Pratik S.Jeughale[3], Divya R. More[4], Atharva P. Bobade[5]
Department of Computer Science & Engineering, Prof Ram Meghe College Of Engineering & Management, Badnera – Amravati
Sant Gadge Baba Amravati University, Amravati, Maharashtra, India

Abstract: ***This project introduces SmartHire, which is an AI-based system created to enhance the interview process by automatically assessing the responses of the candidates. In the conventional interviews, the analysis is more of human interpretation and this is inconsistent and biased in some instances. Due to this, there exists the necessity of a system that will be able to offer fair and precise evaluation.***

The suggested system also allows various types of inputs, including text, voice, and video, where the candidates are free to provide various responses. It employs Natural Language Processing (NLP) and neural network in order to examine the responses. The configuration evaluates such key elements as transparency, relevancy, communication capabilities, and problem-solving proficiency. A major characteristic of this system is the fact that it gives real-time feedback, a characteristic that enables the candidates to know how they perform and can improve on them at the same time.

Workforce reduction and making the evaluation process more uniform have also been prioritized in this project. System is developed in a way that it can be both applicable to practice and actual recruiting interview. On the whole, SmartHire will accelerate, make the hiring process more efficient and fair with the help of AI-based methods.

Keywords: SmartHire, Artificial Intelligence, Neural Networks, NLP, Interview Evaluation, Cognitive Analysis, Real-time Feedback, AI in Recruitment.

I. INTRODUCTION

In the present digitalized world, recruitment process is of the utmost importance in the selection of the right individuals to the jobs. Interview is one of the most crucial techniques of testing the knowledge, communication skills and the general personality of a candidate among all the steps. Nevertheless, conventional interview techniques have a number of constraints. The assessment process largely relies on the opinion of the interviewer, which may be different depending on the individual. This occasionally gives rise to unfair or unequal outcomes. The other significant disadvantage of the traditional method is that it is cumbersome and hard to control particularly when the number of candidates is huge. Interviewers might be fatigued or biased as well which may lead to their decision making. Moreover, the candidates do not frequently get prompt feedback and, therefore, cannot know their failures and change. In order to overcome these issues, it is necessary to have a smart and automated system that would be objective and efficient in evaluating the interview responses. As Artificial Intelligence (AI) and Machine Learning (ML) develop, now it is possible to create systems that can comprehend and study human language.

This is the project where we build SmartHire, Cognitive Interview Response Evaluation Neural Framework. The principal concept of this system is to process the answers given by the candidates using the methods of artificial intelligence (AI): Natural Language Processing (NLP) and neural networks. The system is flexible and easy to work with as it would accept input in various forms such as text, audio and video. This system reviews the responses against a number of aspects which include clarity of explanation, relevance in the question, level of confidence, and knowledge about the subject matter. It is also able to give real time feedback to the candidates and this enables them to know their performance in real time. The feature is applicable both in practice interviews and actual recruitment.

Through such system, we will be able to cut down human labor, reduce bias and enhance the quality of the entire hiring process.

The solution proposed will be scalable, and it can be applied by organizations in large-scale recruitment..

II. LITERATURE REVIEW

Artificial Intelligence has been extensively deployed in the recruitment systems over the last few years to enhance the efficiency and minimise the manual effort. Numerous applications have been created to mechanize the interview procedures and help perform the evaluation of the candidates. Nevertheless, these systems also possess some shortcomings.

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Among the famous platforms, there is HireVue, which analyzes candidates based on the video analysis. It dwells upon verbal and non-verbal communication like facial expression, voice tone, and body language [1]. This is useful in filtering out a big number of candidates in a short period. Nevertheless, it contains certain disadvantages like the threat of algorithm bias and privacy and fairness issues.

The other system is VMock which is primarily applied to resume analysis and interview preparation. It gives feedback about the communication and presentation skills [2]. On the same note, MyInterview also enables job seekers to rehearse video interviewing and provide automated feedback [3]. These websites come in handy to enhance skills among candidates but they are primarily based on simple analysis and do not extensively tackle such cognitive skills as problems solving and critical thinking.

Dialogflow, which is an open-source created by Google, has been popular in creating chatbots to interact with candidates [4]. It will assist in automated initial communication and providing answers to simple queries with the help of Natural Language Processing. Nonetheless, it has low cognitive ability and cannot assess complicated responses.

Based on the discussion above, it is apparent that the available systems offer useful features with a number of limitations. The majority of them fail to offer any real-time feedback, and some of them do not have cognitive analysis of the responses. Also, certain systems can be biased when it comes to the training data.

Consequently, it is necessary to have more sophisticated system capable of offering real-time analysis, limiting bias, and assessing responses in a more precise manner. To overcome these problems, the suggested system, SmartHire, will utilize the NLP, neural networks, and real-time feedback approaches.

III. PROPOSED SYSTEM

The presented system is SmartHire, an Artificial Intelligence-based framework that is aimed at enhancing the interview conduction and evaluation process. In the conventional means of interviewing, the assessment relies mostly on the personal judgment of the interviewer and this could be prone to prejudice, discrepancy, and fallacies. In order to overcome these issues, the suggested system uses AI methods to make the process of assessment of candidate responses more precise, unbiased, and consistent.

Within the framework of this project, a web-based platform is created with the help of which the candidates will be able to attend the interview sessions. This system will offer a user-friendly and easy to use interface that enables users to log in safely and authenticate themselves with Supabase and role-based access control (RBAC) meaning that only authorized people will access the system and execute a certain action. Once the candidate is successful in their login, interview questions are displayed to them. Dynamic question generation is also one of the critical aspects of this system wherein the question can be generated or selected according to a needed domain or topic. This does aid in making the interview environment more flexible and realistic, as is the case in the real world. The system has multi-modal input which gives the candidates the choice of how to answer, they can use text, audio, and video. It is this flexibility that makes the system more feasible and versatile to different kinds of interviews. Written respondents are better handled by text input, audio and video inputs are more realistic simulation of a real interview.

After a response is given, the system starts processing the data. In text entry, NLP methods are used to process the text. It involves preprocessing of the text, identification of keywords, and sentence-level analysis to get an insight of the meaning and structure of the response. Speech is converted to text and processed by the same NLP techniques in case of audio and video inputs.

The system then compares the response against several parameters after processing the input such as relevance, clarity, communication skills, level of confidence, and subject knowledge. These parameters are useful in giving a complete evaluation of the performance of the candidate. This is done by evaluating the model of neural networks which are trained to detect patterns in responses and produce a similar score consistently. The system is not biased and enhances fairness unlike manual evaluation where the same criteria are used on all candidates.

The major characteristic of the suggested system is the offer of real-time feedback. The system will produce instant feedback to the candidate once the assessment is done. This will allow people to know their strengths and weaknesses and correct them. The system is also suitable in practice and learning since the feedback is provided in real-time.

Besides candidate interaction, the system has an administrator panel of the recruiters or system administrators. Using this panel, the administrators are able to control the questions during the interview process, keep track of the candidate replies, performance report, and perform general data system analysis. This makes the system easier to use in the organization.

The web technologies are employed to develop the system. React and Tailwind CSS have been used to provide the frontend to make it an interactive interface to users. The application logic is realized with the help of Node.js, and the database management is carried out with the help of PostgreSQL (via Supabase). The system is installed in the form of Progressive Web App (PWA) that enables the accessibility of the system both on desktop computers and mobile devices.

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In general, the suggested system offers a full and effective automated interview appraisal system. It saves human effort, helps in making assessment more consistent, reduces biasness and even increases the experience of both candidate and recruiter.

IV. PROPOSED ARCHITECTURE

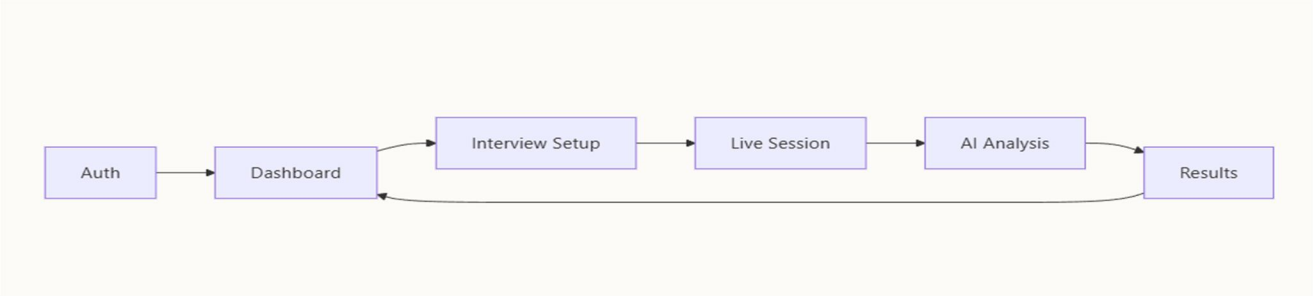


Fig1- Architecture

SmartHire is a proposed system architecture that will offer a systemized and effective workflow to carry out and assess interviews by using Artificial Intelligence. The process is a sequential direction with user authentication being the initial stage and result generation and feedback being the last stages.

The general setup is a set of a variety of modules, such as Authentication, Dashboard, Interview Setup, Live Session, AI Analysis, and Results. Every module has a particular role to play, as well as is involved in the entire interview evaluation process.

The first level is the Authentication (Auth) module whereby users have to log in safely. This module is necessary because the system will be accessed only by authorized users. Authentication and role-based access control with Supabase are applied to be used to control the various types of users which include candidates and administrators.

On successful log in, the user gets redirected to the Dashboard. The dashboard will serve as the central point in which a user will be able to navigate the system. It gives choices like initiating a new interview process, checking the past results, and checking the performance reports. Its dashboard is made not complex and easy to use.

The user gets to the Interview Setup module, and it is visible on the dashboard. Interview questions are also prepared or picked in this stage. The system encourages dynamic generation of questions and in this way, questions can be tailored according to the domain or level of difficulty. This assists in making the interview environment more flexible and realistic.

After the set up, the system passes to the stage of Live Session. This is where the real interview is carried out in this module. The candidate gives feedback in real time through text, audio or video input. This phase is more of a simulated interview situation and records the reactions of the candidate to be analyzed later.

Upon receiving the responses, the AI Analysis is done by the system. The Natural Language Processing (NLP) and neural network models are used to process the input data in this stage. The system evaluates the responses according to several parameters included in it like relevance, clarity, communication skills, level of confidence, and level of knowledge on the subject. In this analysis, all candidates will be evaluated in a consistent and unbiased manner.

Lastly, the Results are created by the system. The results module displays the results score and the feedback in detail. The applicants will be able to see their performance and determine their strengths and weaknesses. The system also stores the results which the users can later view using the dashboard.

A feedback loop has also been used in the architecture, whereby a user can go back to the dashboard once results are viewed and initiate a new interview session should it be necessary. This causes the system to be continuous and easy to use.

In general, the suggested architecture guarantees a data flow between the various modules is smooth and offers a viable solution to automated interview evaluation. It incorporates authentication, real-time engagement, AI-formulated analysis, and result creation into one unified system.

V. METHODOLOGY

This approach of the proposed system explains the chronological order that will be used to design and implement the SmartHire framework. The system integrates the Artificial Intelligence, Natural Language Processing (NLP) and neural network to analyze the responses in interviews in an efficient and organized fashion.

The general operation of the system is broken down into various steps, which begin with user authentication until generation of final results.

At the initial level, the system will be user authenticated. Applicants and managers enter the system via an interface of Supabase authentication. The role-based access control is implemented to make sure that unauthorized users cannot access particular system features [11].

Upon successful entry the system proceeds to interview initiation phase where the candidate is issued with a series of interview questions. The system has the facility of dynamic question creation whereby questions can be chosen on basis of domain or degree of difficulty. This aids in establishment of a more realistic and adaptable interview setting.

The second stage involves the response of the candidates by the system. The SmartHire system embraces the use of multi-modes such as text, audio, and video. In the case of a text input, the responses are directly processed, whereas in audio and video processes, the speech is transformed into text through a speech processing method and then proceeds to subsequent processing.

After the response is obtained, data preprocessing is done by the system. Here we use NLP methods of tokenization, elimination of stop-words and text normalization to clean up and prepare the data to be analyzed [5]. This is done to eliminate irrelevant data and take into account only the meaningful one.

The system does feature extraction after the initial processing. The response is extracted to give important features like keywords, sentence structure, sentiment, and context. These characteristics are used to comprehend the quality and meaning of the answer. Improved contextual understanding is achieved through techniques motivated by contemporary models of NLP such as BERT and word embeddings [10].

The second step is the evaluation of response with the help of neural networks. Trained deep learning models are used to analyze the extracted features and recognize patterns in candidate responses using the system. The neural networks are used in the assessment of parameters like relevance, clarity, communication, and subject knowledge [6][8]. This will be done to make evaluation consistent and eliminate reliance on manual judgment.

The system then produces a rating and a feedback. Real-time feedback is one of the main aspects of this system, on which candidates obtain instant feedback regarding their performance. This feedback will contain strengths, weaknesses and improvement recommendations.

Lastly, the findings are saved on the database and presented to the user via the dashboard. This data can also be accessed by the administrators to track the performance of the candidates and determine the overall trends.

In general, the methodology will provide a seamless transition between the input collection and the ultimate evaluation. The system is accurate, free, and efficient through the use of AI and NLP in evaluating the responses given during interviews.

VI. RESULTS

To test the performance of the SmartHire system, sample interview sessions were done. The system was able to accept various kinds of input, including text, audio, video and was able to give similar evaluation results.

The dashboard shows such key performance indicators as the number of interviews done, average score, practice time, and rate of improvement. It also enables users to initiate diverse kinds of interviews and monitor their developments as time elapses.

After every response, the system gives real-time feedback on the feedback, which enables users to know their strengths and areas of improvement. On the whole, the findings indicate that the system is useful in automation of interview evaluation and enhancement of consistency.

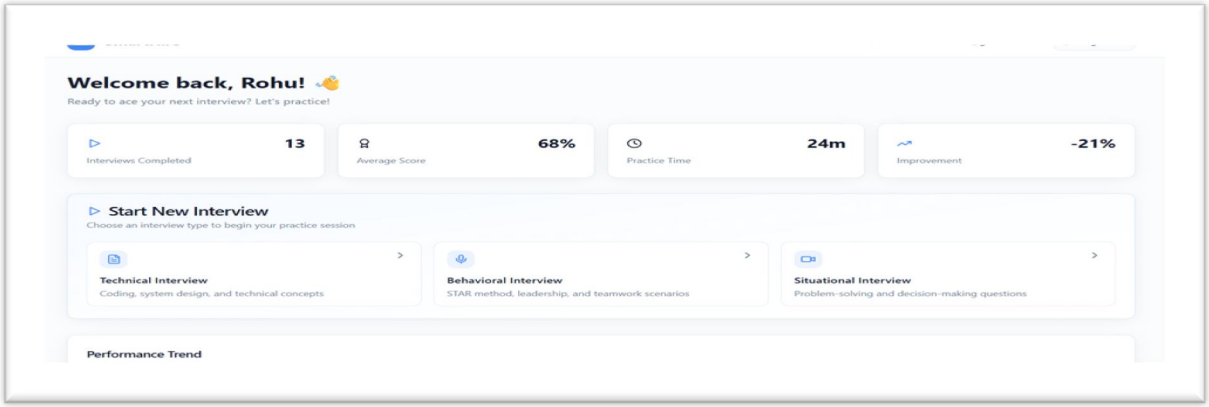


Fig2.1- SmartHire Dashboard Interface.

Figure 2.1 demonstrates SmartHire dashboard interface with the key performance indicators including interviews completed, average score, practice time, and improvement being displayed to the users. It is also able to offer possibilities of initiating new interview sessions by choosing alternative forms such as technical, behavioral and situational interviews.

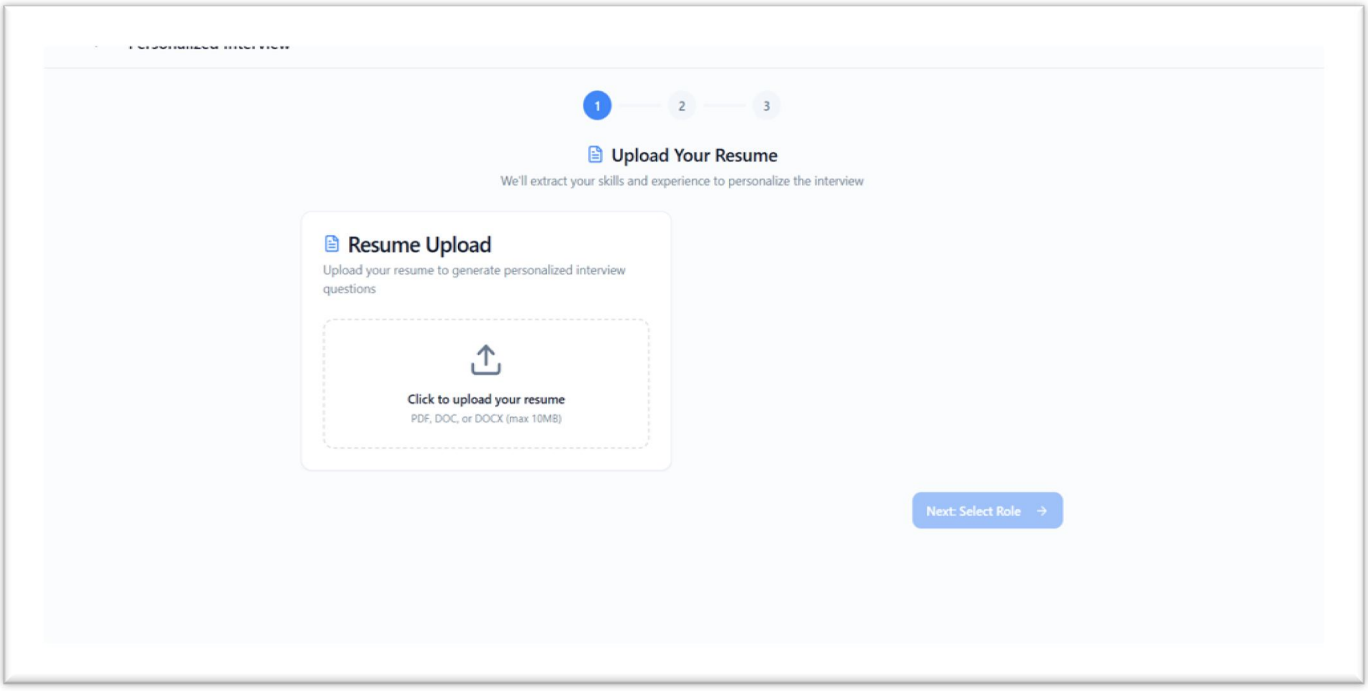


Fig. 2.2: Interview Set-up Interface.

Figure 2 .2 depicts the interface of an interview set up, in which the user is able to choose the kind of interview and edit the parameters to include domain or level of difficulty. In this section, the system will be able to produce or allocate the right questions to be used in the interview session.

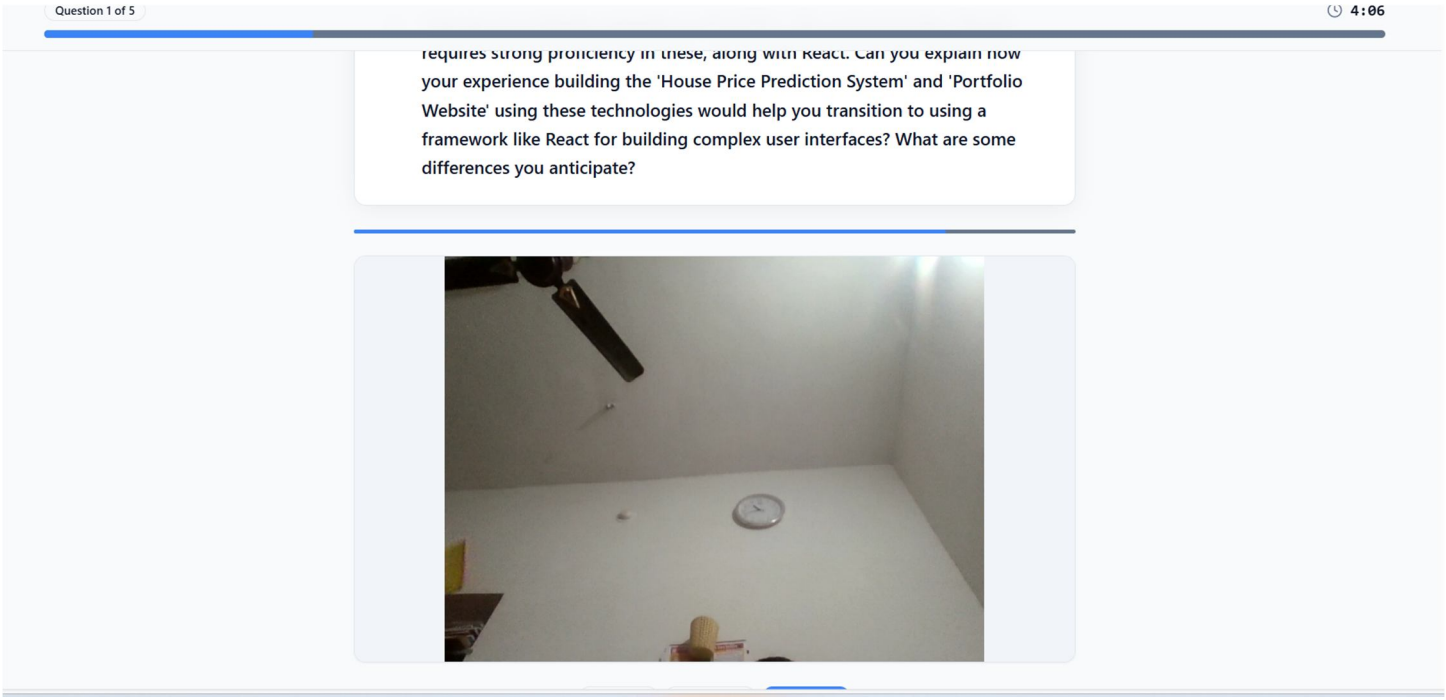


Fig.2. 3: Live Interview Session

Figure 2.3 presents the interface of a live interview session where the candidate can respond to questions in real time through text, audio or video. The responses are noted in the system that can be further analyzed and evaluated.

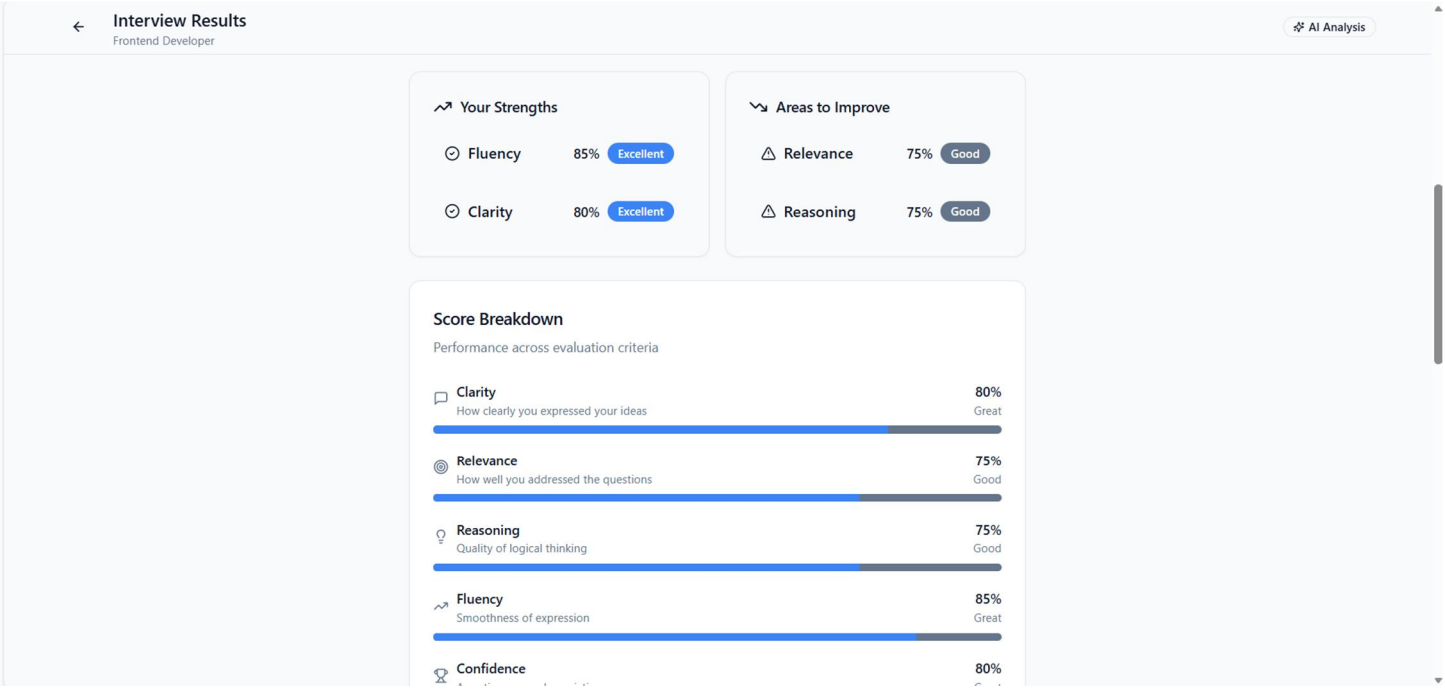


Fig.2. 4: Results and Feedback Interface

The interface in figure 2.4 indicates the results, and the system displays the score of the candidate, as well as detailed feedback depending on the parameters in relevance, clarity and communication skills. This assists the users to know the performance they are doing and what they need to improve.

VII. CONCLUSIONS

In this project, we have created SmartHire, a Cognitive Interview Response Evaluation Neural Framework that would enhance the conventional interview procedure with the application of Artificial Intelligence. The system is meant to be more structured, consistent, and unbiased when it comes to the evaluation of responses of the candidates.

The suggested solution combines the methods of Natural language Processing (NLP) and the neural network to analyze the responses according to the significant parameters criteria, including relevance, clarity, communication skills, and subject knowledge. The system is flexible and simulates real interview situations by supporting multi-modal inputs such as text, audio and video.

The possibility to get a real-time feedback is one of the main benefits of this system which allows the candidates to realize the performance instantly and develop their competencies. Moreover, application of AI makes the judgement less dependent on human power thus low level of biasness and enhanced justice in judgment.

Dynamic question generation and an administrator panel are also part of the system and can be useful to both the candidates and the recruits. On the whole, the suggested framework illustrates that AI can be utilised successfully to optimise the process of recruitment by making it swifter, more stable, and scalable.

VIII. FUTURE SCOPE

Even though the suggested system is a good solution to interview evaluation, various aspects may be improved.

The system can be improved in the future by incorporating analysis of facial expression to have a better insight of the candidate and his/her behavior during the interview. Superior emotion detection methods may also be used to enhance the precision of analysis of confidence and stress measurement. The system can also be increased to accommodate a variety of languages and therefore make it more user-friendly to users in other territories. Also, the framework can be adapted to a more practical use in an organization by incorporating it with the already available HR management systems.

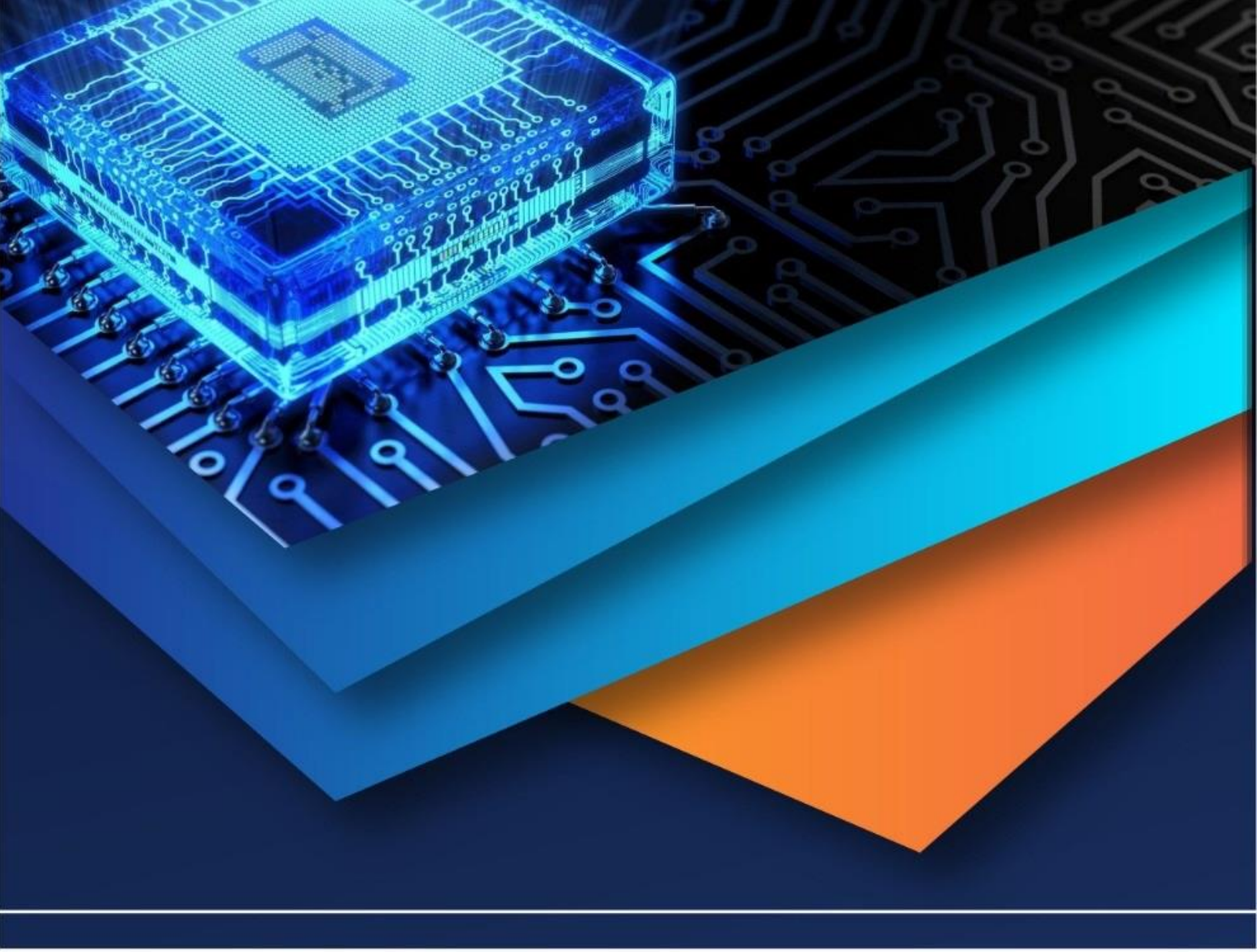
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Future enhancements involve using more sophisticated deep learning models to get more accurate responses in evaluations. It is also possible to develop the system to include a full AI-based interview training platform, where the candidates can train and develop their skills over time.

All in all, the future of this project is broad and in case of further growth it can be a potent tool to the modern recruitment systems.

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