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Advancing Interview AI-Driven Real-Time Mock Interview System for Enhanced Communication and Technical Skills

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Abstract -The machine learning-based mock interview system allows candidates to practice technical, non-technical, and group discussion sessions through a virtual platform. It uses sentiment analysis, emotion detection, and grammar checking to evaluate candidates' performance. The technical session assesses the use of correct technical terms, while the non-technical session grades emotional expression, grammar, and filler words. Group discussions are hosted on the Agora platform for real-time interaction. The system provides personalized feedback and recommendations for improving both communication and technical skills. Developed using Flask, Python, and JavaScript, it integrates features like live emotion detection and grammar error analysis for enhanced practice.

Key Words: Machine learning,Sentiment analysis,Agora platform,Personalized feedback

1. INTRODUCTION

In the post-pandemic era, the world has witnessed a shift to online education, particularly for job preparation and interview training. While traditional placement and training programs were conducted offline, the pandemic has highlighted several drawbacks to this approach. Offline interviews have limited reach, high costs, inconvenience, limited technology, and are time-consuming. In contrast, online interviews offer flexibility, cost-effectiveness, and global accessibility, making them a more efficient mode of training and practice.

To address these challenges, the REMOS (Real-time Mock Interview System) project leverages machine learning to help students prepare for interviews by providing virtual mock interview sessions. This system aids students in developing not only their technical skills but also their communication abilities, including soft skills, facial expressions, and emotional control during interviews. REMOS provides a comprehensive mock interview experience consisting of three different sessions: technical, non-technical, and group discussion. The technical session evaluates how well candidates respond to technical questions, focusing on their use of appropriate technical terms. The non-technical session utilizes a live webcam to assess the candidate's emotional state (pleasant or nervous) during the interview, while also detecting filler words and grammatical errors in their responses. After the session, candidates receive a detailed report analyzing their emotional expressions, filler word usage, and grammar mistakes, which can help them identify areas of improvement.

Additionally, REMOS offers an online platform for group discussion practice, where users can interact with other participants and share opinions on various topics. This fosters collaboration and improves communication skills. The system's self-analysis feature allows candidates to reflect on their performance and make improvements. The website uses machine learning to automatically detect emotional cues and grammar issues, providing users with insights and a chance to review their responses, which ultimately boosts confidence and helps improve interview skills.

2. LITERATURE REVIEW

[1] In the paper by Yang Weon Lee, a practical method for real-time hand tracking in dynamic virtual interview environments is proposed. Using particle filtering, the system tracks hand motion on a 2D image plane, achieving reliable results with a 75% reduction in required particles. The approach uses color and motion cues for dynamic gesture recognition, suitable for interactive interviews. The paper acknowledges the need for further research, particularly in high-dimensional tracking, such as 3D articulated objects. Additionally, the growing importance of audio content in digital media has led to the development of automated audio analysis tools for applications like speech recognition and multimodal analysis.

[2] Gianni Pavan's study introduces pyAudioAnalysis, an open-source Python package for audio analysis. It offers features like signal classification, feature extraction, supervised and unsupervised segmentation, and content visualization. This flexible library allows users to develop audio classifiers, extract features, segment audio, and visualize connections. It has

gained popularity in academic and scientific circles due to its versatility. The study also highlights the importance of preparation for technical interviews, emphasizing the need for reviewing technical concepts, practicing problem-solving, and seeking expert advice. Mock interviews, research on company requirements, and clear communication of technical concepts are essential for success.

[3]Vikash Salvi et al. propose a system designed to help interviewees practice for technical aptitude tests. The system uses natural language processing (NLP) techniques, specifically the PDFBox library, to extract information from the interviewee's resume, such as skills, marks, achievements, and certifications. Based on this data, it generates an adaptive technical aptitude test with varying question difficulty tailored to the interviewee's profile. The difficulty level adjusts according to the interviewee's answers, providing a dynamic and personalized testing experience. After the test, the system evaluates the performance, offering detailed feedback, including the number of correct and incorrect answers, and updates the interviewee's level. Additionally, the system includes a feature for practicing face-to-face interviews using a 3D human model. The system assesses the interviewee's responses and confidence levels through facial detection and voice input, offering feedback and a final score after multiple sets of questions. This helps interviewees improve their performance and confidence.

[4]M. Kathiravan et al. propose a web-based interview platform built using Node.js and Express.js, designed to streamline and simplify the interview process. Key features include a real-time collaborative code editor, video/audio conferencing, a chat box, and a collaborative whiteboard. These tools are integrated into a single tab, preventing users from switching between interfaces. Interviewers can sign up through Facebook or email, and the platform stores user data securely in MongoDB Atlas. When creating a new task, a unique meeting ID is generated, allowing interviewers and interviewees to share the meeting link. The platform supports various features like video calls, code editing, and screen sharing. It also records code input to prevent data loss. Additionally, Moh. Kholilurrahman Jailani and Laela Hikmah Nurbatra's research on virtual reality-based interview applications revealed a successful design with high validation scores. Their application helps job seekers prepare for interviews by offering scoring, flexibility, and detailed feedback.

[5]Matthew D. Pickard and Catherine A. Roster's paper investigates the impact of interviewer embodiment on social desirability bias (SID) in open-ended interviews. Their laboratory experiment found that human faces in interviews inhibit SID, suggesting respondents are less likely to give socially desirable answers when speaking to a human interviewer. However, the study also noted that computer-based systems, like Audio Computer-Assisted Self-Interview (ACASI), may elicit more SID. The research emphasizes that both human and automated interviewers can influence responses, but neither is inherently better. The study supports the social interface theory, suggesting that even subtle embodiment, such as a virtual human face, can mitigate social inhibition. ECAs (embodied conversational agents) can match human interviewers' performance while offering benefits like standardization, scalability, cost savings, and empathy, making them ideal for collecting sensitive information while maintaining privacy and a human-like touch. Further research is needed to explore these effects fully.

[6] The paper by Hung-Yue Suen et al. presents a semi-supervised convolutional neural network (CNN) model using TensorFlow to predict interviewees' personality traits and communication skills. The AVI-AI software application, used on Android and iOS devices, recorded and analyzed participants' audio-visual responses to assess their interpersonal communication abilities. The study found that nonverbal communication is crucial in evaluating personality traits, consistent with Social Signaling Theory and the Lens Model. Meanwhile, the work by Sujanaa J and Palanivel S focuses on real-time emotion recognition using CNN with mouth and face images, achieving high accuracy and showing potential applications in various fields like healthcare and gaming.

[7]The paper by Siddhant Singh et al. presents an AI-powered hiring system that streamlines the recruitment process, reducing the need for staff and minimizing the time spent narrowing down candidates. The system consists of two panels: an admin panel for HR professionals and recruiters, and a candidate panel for job seekers. Built using NodeRED, Cloudant for the database, and IBM Cloud services like Personality Insights and IBM Discovery, the system automates several stages of hiring. The process includes three rounds: registration, a technical round where job-related questions are asked, and a personality test assessing attitude, demeanor, and curiosity. During the technical round, candidates' resumes are compared to job requirements, and those shortlisted proceed to the assessment of their personality traits. In the admin panel, the selected candidates are ranked based on their performance in the technical round. This system helps efficiently screen, select, and rank candidates with minimal manual intervention.

[8] Bo-Young Kim's research presents an AI-based interview system that generates over 100,000 evaluation data sets from 400,000 interview image data sets using deep learning technology. This system aims to improve efficiency and fairness in the job interview process by leveraging big data and AI. It offers businesses a way to overcome limitations of traditional hiring methods, reducing interview costs and time, while enhancing effectiveness. Job seekers benefit from the flexibility to participate remotely, and the system provides a more objective assessment of candidates based on their

qualifications, rather than appearance, accent, or gender. Overall, it aims to create a fairer and more accessible job selection process.

3. PROBLEM STATEMENT

In today's competitive job market, candidates are required to showcase not only technical expertise but also effective communication, critical thinking, and problem- solving skills. Interviews are a high-stakes environment where these abilities must be demonstrated seamlessly, yet many job seekers struggle with interview performance due to limited preparation tools. Traditional methods, such as peer mock interviews, in-person coaching, or self-practice with standard questions, often fall short of preparing candidates effectively. These approaches lack personalization, adaptability, and fail to provide real-time feedback, leaving candidates uncertain about their readiness and unsure of areas needing improvement.

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The need for a comprehensive, AI-driven solution that not only mimics the interview environment but also provides instantaneous, constructive feedback on both communication and technical skills is evident. Such a system would bridge the gap between theoretical knowledge and practical application, giving candidates the tools to refine their responses in real-time and enhance their overall performance.

4. PROPOSED SYSTEM

Our proposed system combines video and audio analysis to offer feedback on a user's performance in mock interviews and group discussions. Using techniques like emotion detection, speech recognition, filler word analysis, and grammar checking, the platform helps users identify areas for improvement. Additionally, the group discussion module encourages real-time collaboration, allowing users to practice teamwork and communication skills. With detailed scoring systems for both interviews and discussions, the platform enables users to track their progress and refine their skills for real-world scenarios.

This section presents a detailed overview and its six key modules. They are given below:

1. Technical Questionnaire Module: This module focuses on assessing the candidate's technical knowledge. Candidates answer questions, and their responses are graded based on the correct technical terms used. The system compares candidates' answers with a database of terms to evaluate their proficiency in relevant technical areas.

2. Non-Technical Session Module: In this module, the candidate responds to non-technical questions while being monitored for emotional expressions, grammatical errors, and the use of filler words. The system analyzes the candidate's performance, helping them improve their communication skills.

3. Group Discussion Module: This functionality allows candidates to participate in a simulated group discussion using video conferencing. It enables real-time interaction, providing a platform for candidates to express their opinions and interact with others. The group discussion module also helps users build confidence in participating in discussions.

4. Feedback and Reporting Module: After each session, candidates receive a report that includes visual feedback (like pie charts) on their emotional state during responses, as well as their performance metrics such as grammatical accuracy and use of filler words. This feedback is designed to help candidates self-assess and identify areas for improvement.

5. Emotion Detection Module: Utilizing the FER 2013 dataset, this module detects the user's emotional expressions during interviews. It helps assess whether candidates appear nervous or confident while they practice, providing another layer of feedback to improve their interview skills.

6. Overall System Functionality: The system also includes a user-friendly interface that guides candidates through the process of using the platform, making it accessible for users to practice their interview skills systematically.

RESULTS AND DISCUSSION

The project successfully developed a mock interview platform featuring technical and non-technical interviews, a group discussion platform, and real-time feedback on performance. It uses emotion detection via the FER 2013 dataset, analyzing user expressions to assess nervousness or confidence.

A grammar and filler word detection module improves language fluency, while adjustable interview types cater to different user needs. Integrated with the Agora SDK for seamless video conferencing, it provides high-quality, low-latency communication. The system allows for flexible, accessible, and free practice, helping candidates enhance both technical and communication skills for interviews at their convenience.

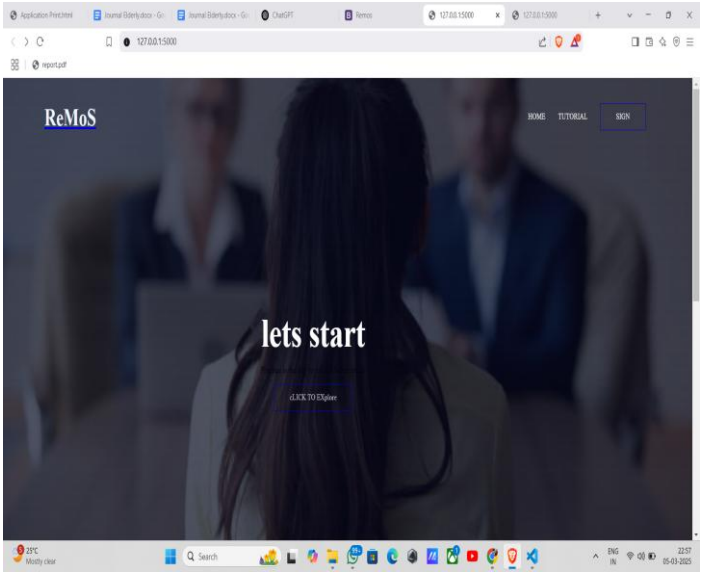

Fig 1: Home Page

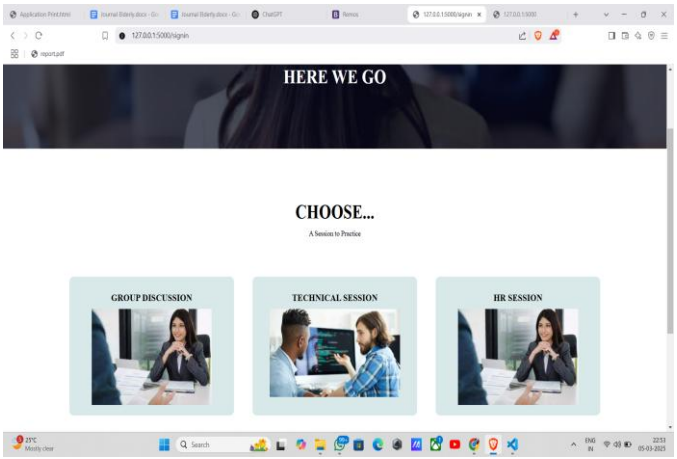

Fig 2: Selection Page

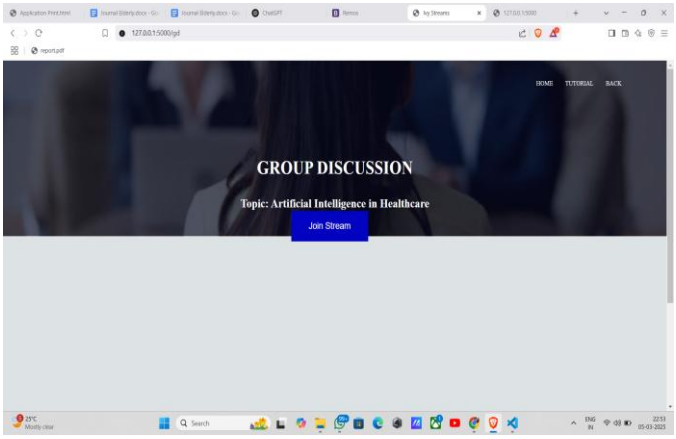

Fig 3: Group discussion

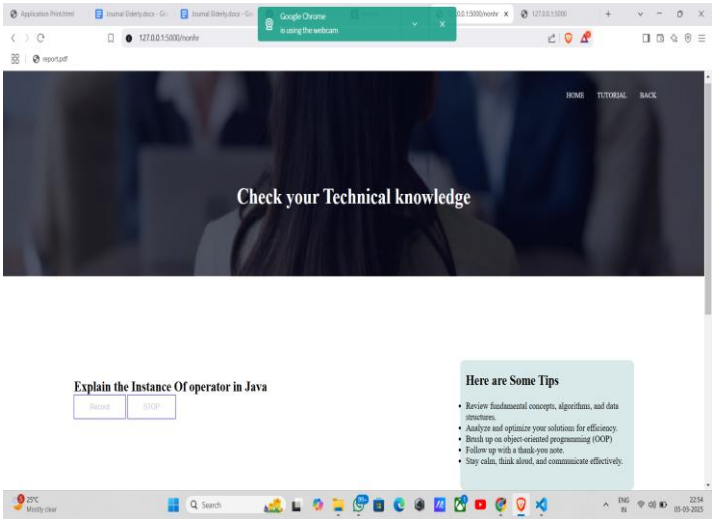

Fig 4: Technical session

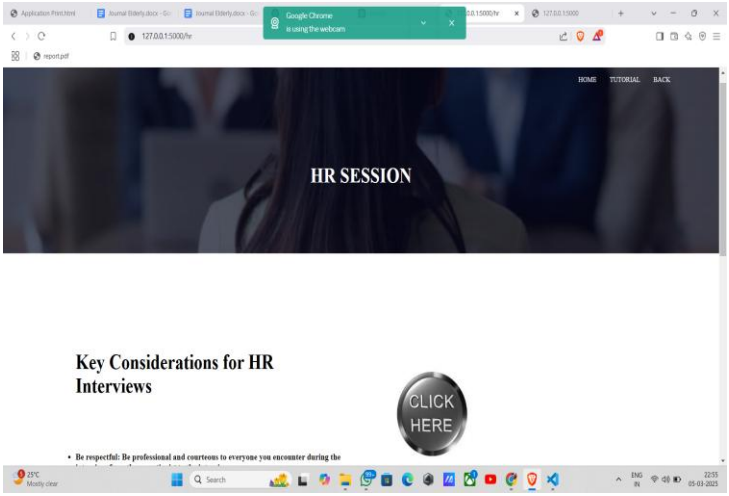

Fig 5: H R session

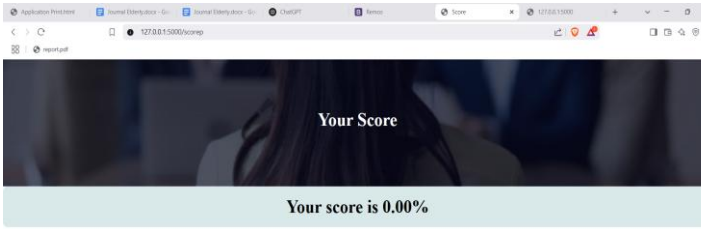

Fig 6: Score Page

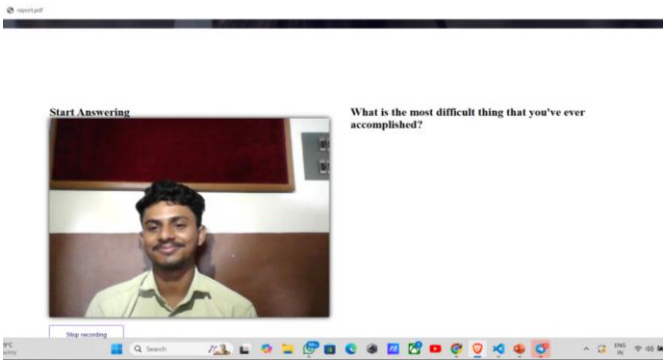

Fig 7: Real time HR interview

6. CONCLUSION

The 'REMOS' mock interview platform aims to help beginners build confidence in online interviews. It enables users to practice technical and non-technical questions, provides self-assessments, and offers real-time feedback. The system currently randomizes questions from various fields but could be enhanced to analyze users' weaknesses by tracking performance in specific areas. Future improvements include a group discussion module, where users are allotted equal speaking time and can receive feedback on grammatical errors and relevance of their responses. A personalized scorecard would highlight strengths and weaknesses, offering suggestions for improvement.

Further enhancements could involve integrating a resume extractor to evaluate the ATS-friendliness of resumes and provide improvement suggestions. An aptitude section would allow users to practice problem-solving skills, with a timer and scorecard to track progress. Additionally, a 3D human-like model could be added to simulate interview scenarios with perfect lip-syncing, making the experience feel more lifelike and interactive, akin to an offline interview.

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