

AI Based Mock Interview Web-Application with Real-Time Facial Expressions Recognition

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ABSTRACT

Preparing for job interviews can be challenging for many students and job seekers due to the lack of structured practice platforms and real-time feedback. Traditional mock interview sessions often rely on human evaluators and therefore may lack consistency and accessibility. This research presents an AI-based mock interview web application that integrates artificial intelligence, speech recognition, and facial expression analysis to simulate realistic interview scenarios.

The proposed system is developed using React.js for the frontend interface and Node.js with PostgreSQL for backend data management. The application utilizes the Google Gemini API to dynamically generate interview questions tailored to the user's selected job role and experience level. In addition, computer vision techniques implemented using OpenCV and the Haar Cascade classifier enable the system to analyse facial expressions and detect emotional indicators such as confidence and stress during interview responses.

The React Speech Recognition Hook allows candidates to respond verbally, creating a more natural and interactive interview experience. By combining AI-generated questions, speech recognition, and real-time emotion analysis, the system provides meaningful feedback that helps candidates improve communication skills, confidence, and overall interview performance.

Keywords: Artificial Intelligence, Mock Interview System, Facial Expression Recognition, Speech Recognition, Interview Preparation, Computer Vision.



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I. INTRODUCTION

In today's highly competitive employment environment, interview preparation plays a critical role in securing job opportunities. Many candidates possess adequate technical knowledge but often struggle to present their ideas effectively during interviews. Lack of practice, limited feedback, and nervousness are some of the key factors that negatively influence interview performance.

Traditional mock interview practices are usually conducted by mentors or training institutes. Although these methods can provide useful guidance, they are often time-consuming, subjective, and difficult to access for many students. In addition, these approaches rarely evaluate behavioural aspects such as facial expressions or emotional responses during interviews.

With the rapid development of artificial intelligence technologies, new opportunities have emerged for improving interview preparation systems. AI-driven platforms can analyse verbal responses, facial expressions, and behavioural patterns to provide objective feedback to candidates.

The proposed AI-based mock interview system aims to simulate a realistic interview environment where candidates can practice interview sessions and receive immediate feedback. By analysing

both verbal and non-verbal communication signals, the system helps users understand their strengths and areas for improvement.

This AI-based mock interview system incorporates speech processing, facial expression recognition, and AI-driven question-answer analysis to provide a realistic, interactive, and data-driven interview simulation, thereby addressing existing constraints.

II. RELATED WORK

Recent research has explored the integration of artificial intelligence in interview preparation systems and behavioural analysis. Early AI-based interview platforms primarily focused on analysing textual responses provided by candidates. However, later studies highlighted the importance of non-verbal communication during interviews.

The study *“AI-Powered Interview Preparation: Enhancing Non-Verbal Communication Analysis”* (2021) demonstrated how technologies such as OpenCV, Keras, and deep learning algorithms can be used to analyse facial expressions and emotional behaviour. Incorporating such techniques into mock interview systems allows candidates to receive more personalized feedback regarding their confidence and communication style.

Advancements in deep learning have also improved real-time facial expression recognition. The research *“Deep Learning and Computer Vision for Real-Time Facial Expression Recognition”* (2022) showed that convolutional neural networks can accurately classify emotional states from facial images. This capability helps identify behavioural signals such as nervousness, hesitation, or confidence during interviews.

Another significant development is the use of AI-driven interactive systems that analyse user behaviour in real time. The study *“Real-Time Data Analysis in AI-Driven Interactive Systems”* (2023) highlighted how machine learning-based feedback mechanisms can improve learning outcomes and user engagement. Similar concepts are applied in the proposed system, where the Google Gemini API generates interview questions, OpenCV performs facial expression analysis, and speech recognition technologies analyse verbal responses.

Furthermore, generative AI models have recently been used for automated question generation. Research on *“Generative AI Models for Custom Interview Question Generation”* (2023) explains how large language models such as Gemini and GPT can produce domain-specific questions tailored to job roles and candidate experience levels. This approach helps create more realistic and adaptive interview practice environments.

In addition, multimodal emotion recognition systems that combine facial expressions, speech patterns, and textual analysis have gained attention. Such systems provide deeper insights into candidate behaviour and performance by analysing multiple communication signals simultaneously.

III. RESERACH METHODOLOGY

PROBLEM STATEMENT

Common Problems in Interview Preparation

➤ Restricted Access to Professional Coaching

Premium interview coaching services are frequently costly and contingent upon location. A significant number of job searchers, particularly students and recent graduates, lack the financial means or access to professional coaching, so hindering their capacity for successful preparation.

➤ **Inaccessible to Remote Users:**

Due to lack of a centralized digital platform, many users in remote or rural areas are unable to access quality mock interview preparation tools that provide full feedback (verbal + non- verbal).

➤ **Lack of Data-Driven Evaluation:**

Conventional interview coaching relies on subjective human judgement rather than structured analysis.

➤ **Lack of Continuous Learning:**

Without automated feedback systems, candidates cannot easily track improvements or identify weaknesses.

➤ **Limited Accessibility:**

Professional interview training services can be expensive and inaccessible to many students.

➤ **Lack of Non-Verbal Feedback:**

Most preparation systems focus only on verbal answers and ignore non-verbal communication such as facial expressions and eye contact.

To overcome these challenges, an AI-driven mock interview platform is required that provides automated evaluation and real-time feedback.

IV. EXPERIMENTAL SETUP & ANALYSIS

ANALYSIS OF PROBLEM

In the current competitive job market, thorough interview preparation is crucial; nevertheless, conventional methods do not adequately tackle the primary obstacles encountered by job seekers.

The system was implemented using React.js for the frontend and Node.js for backend processing. PostgreSQL was used to store user data and interview responses. The Google Gemini API was integrated for dynamic question generation.

Emotion detection experiments were conducted using OpenCV and Haar Cascade classifiers. The system successfully identified facial expressions during interview sessions and provided behavioural insights to users. Speech recognition enabled candidates to respond verbally, improving the realism of the interview simulation.

The experimental results indicate that combining speech analysis and emotion detection can provide more comprehensive feedback for interview preparation.

- Customised assessment via AI analysis
- Affordable and accessible mock interview options
- Immediate feedback on verbal communication
- A cyclical learning approach for ongoing enhancement

FLOWCHART

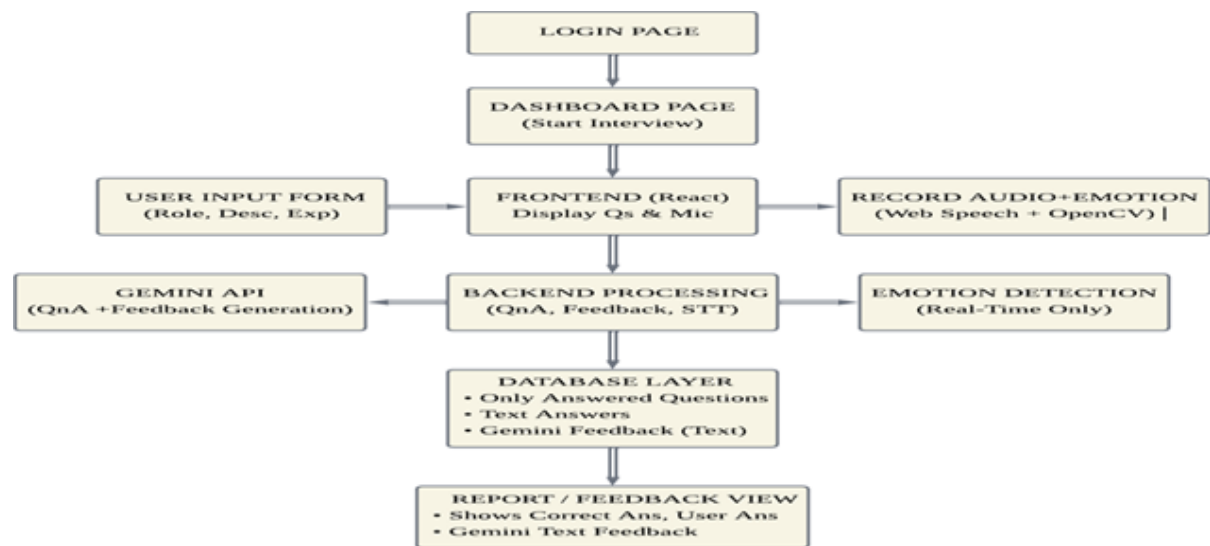


Figure 1: Complete Workflow of AI-Based Mock Interview System

SYSTEM ARCHITECTURE

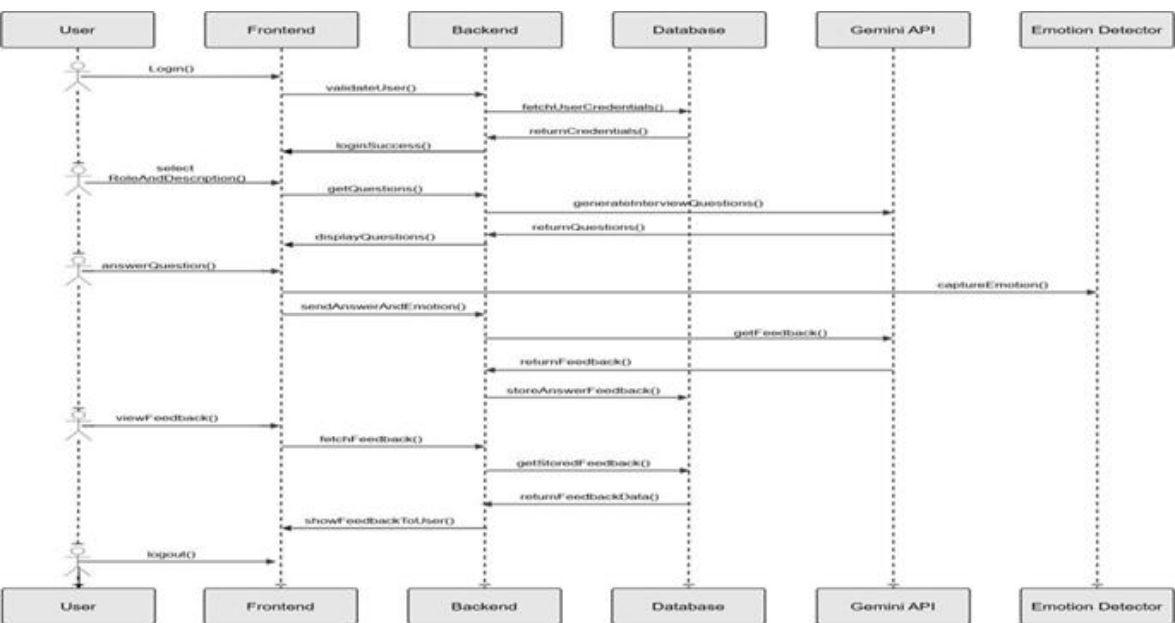


Figure 2: Sequence Diagram of the System

EMOTION DETECTION PROCESS

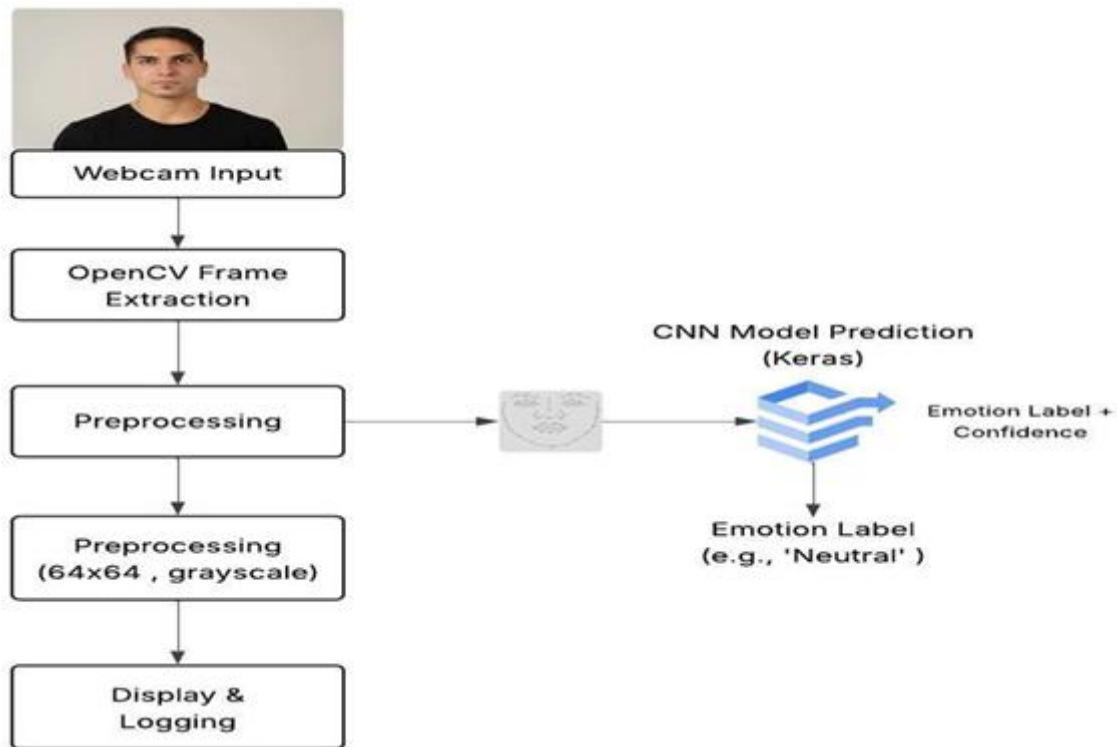


Figure 3: Emotion Detection Process

V. CONCLUSION AND FUTURE SCOPE

CONCLUSION

In a variety of various ways, the mock interview system that is powered by artificial intelligence helps workers get more prepared for job interviews. These methods include, but are not limited to, delivering feedback in real time, undertaking analysis of emotions, and generating questions through the utilisation of artificial intelligence. When it comes to accessibility, scalability, and cost-effectiveness, it is beneficial for businesses as well as job seekers to take advantage of it that it is available. This strategy, which also helps save time and increases the proportion of successful interviews, makes it possible to eliminate bias. Additionally, it helps save time. Both aims pertaining to inclusion and sustainability are supported by the fact that it can operate from a remote location.

FUTURE SCOPE

Multilingual Support:

At present, the system primarily supports interviews conducted in the English language. In future versions, additional language options could be introduced to make the platform accessible to users from different linguistic backgrounds. Providing support for regional and international languages would improve inclusivity and allow candidates from diverse regions to practice interviews more comfortably.

AI-Driven Voice Modulation Analysis:

While the current system evaluates facial expressions and spoken responses, future improvements may include analysing voice modulation. Elements such as tone, pitch, speaking speed, and pauses often reflect a candidate's confidence and emotional state. By incorporating voice analysis, the system could provide more detailed feedback about communication quality. Additionally, integrating the platform with job portals such as LinkedIn could allow the system to generate

interview questions based on real job listings.

Live Interview Simulation with AI Avatars:

Another potential enhancement is the development of virtual interviewers powered by artificial intelligence. These avatars could simulate realistic interview conversations by asking follow-up questions and reacting to candidate responses. Such interaction would help create a more immersive interview practice environment.

Progress Monitoring and Intelligent Suggestions:

Future versions of the system could also include performance tracking features. By storing and analysing previous interview sessions, the platform could monitor user progress over time. Based on this data, the system may provide personalised suggestions that help candidates improve specific communication or behavioural skills.

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