

AUTHOR INDEX

A

Abdulla, Md Mustafa
 Abdur Razzak, Md
 Abhang, Sandeep P.
 Abhishek, Kumar
 Amthan, Al
 Ash, Rajeet
 Azam, Md Esmay

B

Bal, Sauvik
 Banerjee, Saptarshi
 Banerjee, Subhabrata
 Bera, Soham
 Berger, Bernhard J.
 Bhalke, Daulappa
 Bhatotia, Dinesh
 Bhowal, Kamalika
 Bishnu, Soham Kanti
 Boral, Soma
 Bose, Tuheena
 Biswas, Susmita

C

Charan, Kavali
 Chakrabarty, Dipanwita
 Chakraborty, Abir
 Chakraborty, Arindam
 Chakraborty, Debrupa
 Chakraborty, Haimanti
 Chakraborty, Niladri
 Chatterjee, Debashis
 Chatterjee, Satakshi
 Chatterjee, Shamba
 Chate, Tejashri Laxmikant
 Chavan, Sayali
 Chougule, Sukumar
 Choudhury, Suvadip
 Chowdary, Madala Abhilash

D

Das, Atanu Kumar
 Das, Avik Kumar
 Das, Chitrita
 Das, Divyang
 Das, Gunjan
 Das, Harshit
 Das, Karishma
 Das, Preeti
 Das, Rishav
 Dasgupta, Kousik

Dasgupta, Srijani
Datt, Abhilash G.
Dey, Preeti
Drechsler, Rolf
Dutta, Ahona
Dutta, Ayan
Dutta, Barshan
Dutta, Chandradeep
Dutta, Monalisa
Dutta, Sangita
Dutta, Satavisha
Dutta, Soumyarup
Dutta, Susmita

G

Ganguly, Malay
Ganguly, Rajiv
Ghosh, Ahona
Ghosh, Aniruddha
Ghosh, Arijeet
Ghosh, Arnab
Ghosh, Prajakta
Ghosh, Sreedeeep
Ghosh, Subhadeep
Ghosh, Sudipta
Gorre, Srinivas Rao
Gupta, Arkabrata

H

Haldar, Chandramouli
Halder, Indrani
Harish, V. S. K. V.
Hazra, Soumyajit
Hedao, Anushka

J

Jadhav, Vishakha
Jana, Susovan
Jayakrishnan, A
Jha, Ramnika

K

Karmakar, Samit
Karmakar, Tuhin
Kirtuniya, Subhodeep
Kulkarni, Madhura

M

Maity, Souvik
Majumdar, Sayan
Mandal, Lopa
Mandal, Sandip
Mazumder, Srija
Meshram, Karishma

Mishra, Sanjukta
Modak, Santanu
Modak, Souvik
Mondal, Ayantika
Mondal, Prama
Mukherjee, Tista

N

Nandi, Apurba

P

Paikrao, Pavankumar D.
Pal, Pamela
Panda, Soumyajeet
Plump, Christina
Podder, Soumik
Pramod, Adrija R.

R

Rakshit, Riddhiman
Rashid, T. H. M. Rimon
Rath, Dibyendu
Rao, Peddireddy Veera Venkateswara
Ronald, M
Roy, Minakshi
Roy, Piya
Roy, Siddhartha

S

Saha, Arpita
Saha, Nitu
Santra, Raisa
Sarkar, Rangon
Sau, Suparna
Sayyad, Farhina
Sekhar, Sreeram Chandra
Selvan, C
Shahu, Swayam
Sharma, Arun
Sharma, Kalpana
Sharma, Shambhavi
Shaw, Namrata
Sil, Arindam Kumar
Srivastava, Divyanshi
Srivastava, Harshit
Sutar, Sanjay D.

V

Vaidya, Chandu
Vansdadiya, Rajesh
Veningston, K

W

Wagh, Meenal

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An Intelligent Multi-Modal AI Framework for Interview Simulation with Speech Recognition and Real-Time Feedback

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Abstract: The creators of this system also empowered it with an intensity and versatility that can mimic the real interview situations pretty close. With the help of voice recognition tailored to the job role, exclusive question repositories, and dynamic feedback systems, the system is able to produce very credible and lively scenarios that are very helpful in the preparation and support of the candidates as well. Candidates are divided into three main categories, namely: technical skill, language skill, and emotional intelligence. The user interface frontend is developed using Next.js and the backend processes are handled by Node.js. The architecture of the system is designed in such a way that it can support a high volume of users who can access it quickly and at the same time with almost no delay, and Neon DB handles the databases at an exceptionally fast and serverless like manner for the management of system databases. Among other important findings, one significant discovery is the introduction of the Gemini API, which enables the production of mock interview questions and provides instant feedback as well. The smooth transition from one task to another has not only helped the user to take part in the platform but made the participation also more effective. User testing results together with initial evaluations pointed out that the candidates who went through practice in real interviews were more ready. As per the preliminary evaluations, the system has the potential to recreate the realistic scenario and thus, coupled with user preparedness that is increased, it offers a scalable and convenient interview solution at the same time.

Keywords: *AI in Recruitment, Multi-Modal Interview Simulation, Real-Time Feedback Generation, Speech Recognition*

I. INTRODUCTION

Artificial intelligence (AI) is still on the way to totally changing human interaction in a variety of fields, including education, recruitment, and professional development. Among them, interview preparation stands out as one of the most significant yet least used areas, which usually lacks

realistic, real-world scenarios and prompt, personalized feedback. Traditional mock interview systems usually present a limited set of static questions, very little behavioral analysis, and little customization to specific job roles. Virtual recruitment has increased tremendously in the last few years. Thus, the need for immersive AI-powered interview preparation tools that can judge candidates both on their technical knowledge and soft skills has grown accordingly. The best proposal in this regard is the Intelligent Multi-Modal Interview Simulation Platform (IIMISP), which is a mock-interview platform hosted on the cloud using the latest AI technologies to create the exact conditions of a real-world interview. The system provides Real-Time Performance Feedback (RTPF), voice recognition for spoken responses, and dynamic question generation (DQG) based on job roles through the Gemini API. Also, it incorporates behavior monitoring through camera tracking and provides secure, role-based access via Clerk, all of which are supported by a scalable cloud infrastructure powered by Drizzle ORM and Neon DB.

A. Research Gap

The majority of current AI-based interview platforms do not fully support multi-modal performance evaluation, despite recent improvements. They frequently fall short of combining behavioral feedback, personalized question creation, and speech-to-text input into a single system. Furthermore, these platforms are rarely robust or scalable enough to guarantee data security and real-time user interaction. Academic literature has not yet thoroughly examined a comprehensive solution that combines cloud-native scalability, user emotion recognition, and natural language understanding.

B. Research Objectives

The following are the study's main goals.

- To create and execute an AI-powered, scalable IIMISP that uses voice, natural language processing, and behavior analytics to replicate authentic interview scenarios.
- Using RTPF mechanisms, assess user performance in technical, communication, and emotional domains.
- To solve issues with scalability and privacy by utilizing effective cloud database solutions and safe user authentication.

C. Novel Contributions

IIMISP really advances the concept of personalized, efficient, and accessible interview preparation since it combines the integration of state-of-the-art AI-powered capabilities with the overcoming of the limitations of existing systems. IIMISP tries to bring in the new technologies together with the traditional interview preparation methods [1]. The platform is empowered by AI, NLP, and speech recognition technology, making it entertaining and effective for users to prepare for the interviews [2]. With Praxis AI, a full-stack, IIMISP integrates behavior monitoring, AI-generated feedback, and voice-to-text input for an extensive candidate evaluation. The user role and capability-specific DQG system is implemented through the use of the Gemini API.

A solid and flexible infrastructure is built by NeonDB together with Drizzle ORM for seamless data management and cloud deployment, and Clerk for user authentication, which is secure and scalable.

The platform comes along with features such as real-time evaluation of performance, automated question sets based on the job role, and interviewing practice with the help of voice recognition technology [3]. Besides the technical skills, the user is also assessed on the level of confidence, personality, and communication skills [4]. The use of high-end frameworks like Next.js, Node.js together with databases like Neon DB and Drizzle ORM, allows our platform to be fast, scalable, and secure in terms of data management. Besides that, Clerk's secure user authentication provides users with an interface that is both easy to navigate and safe [5].

Our platform helps to tackle the main problems in the processes of interviewing, namely: not receiving quality feedback, the challenge of assessing soft skills, and the absence of accessible environments for realistic mock interviews [6]. Since candidates are able to practice with the help of AI-driven features of analysis and receive and act on feedback immediately with this system, this transforms their attitude towards preparation making it a critical component of personal growth for any individual looking out to move up the career ladder [7].

II. LITERATURE SURVEY

To deal with interview difficulties, the research paper proposes a mock interview evaluation system that is driven by AI. It emphasises the significance of candidate characteristics and first impressions, as well as the part the interviews take in the hiring process. It accentuates the

importance of practicing by means of simulated interviews and the degree to which AI integration is indispensable. The reviewer's critic holds the current systems accountable for ignoring emotions as well as the pandemic-driven shift to remote interviews. Through showing a more holistic evaluation process, the innovative character of the new system is supported. The literature review in conjunction with the evolution of interview process, gives a strong reason for the AI-based mock interview system and considers it a very useful tool for both candidate evaluation and preparation [1].

Chou et al. (2022) proposed an AI-based mock interview platform that could not only predict the technical responses of the candidates but also their personality traits through the application of predictive models [1]. Although the system was resilient in the aspect of modeling, it was still lacking in the incorporation of emotion and behavioral feedback. AIIMISP is the one that eliminated this shortcoming as it provided an evaluation through the monitoring of the camera and the analysis of the emotions. Dissanayake et al. (2021) created an AI-based behavioral analyzer for the interview and viva settings that recognized among others, the non-verbal cues such as the participants' eye contact, head gestures and smiling, and so on to analyze their behavior [2]. The model succeeded in behavior interpretation accuracy that was over 85% but it could only be applied in educational environments. AIIMISP is the one that goes one step ahead by taking advantage of the behavioral insights and voice-based response analysis for the in-depth evaluations in expert mock interviews.

Lee and Kim (2021) considered the practical application of AI interview systems in the Korean market as a strong point, stating performance-based evaluation and fairer hiring as the main benefits of the technology [3]. Nonetheless, their approach was mainly goal-oriented and efficient, without much flexibility for personalization. In contrast, AIIMISP utilizes the Gemini API to generate personalized question sets and feedback while allowing users to select job roles and interests. With NLP techniques such as concept graphing and semantic similarity scoring, Bagaria et al. (2020) investigated the problem of automatic grading systems for open-ended answers [4]. The authors' system, although applicable to the educational domain, lacked voice input and real-time feedback features. In contrast, AIIMISP adopts a more advanced approach incorporating the use of speech recognition and offering immediate feedback instruments tailored for job interviews.

Mandal et al. (2023) have elaborated on the creation of an evaluator for mock interviews based on AI that focuses on the automatic classification of confidence and emotion [5]. The system was neither able to scale nor was it compatible with the cloud, although it was able to classify emotional responses successfully. AIIMISP takes the burden off by providing robust backend facilities (NeonDB, Drizzle ORM) and ensuring user management (Clerk) security for the large-scale distribution. Various papers signal out the technical and ethical issues related to

AI in the evaluation process. Dignum (2020) and Jobin et al. (2019) place the necessity for fairness, privacy protection, and responsible AI making as the most important [6][7]. Among other things, AIIMISP solves the issues by providing secure user authentication, encrypting data handling, and obtaining feedback through well-defined processes, to mention just a few.

A. Problems Addressed

Our AI Mock Interview platform tackles a number of important issues. The following major issues with the current interview preparation systems are addressed by the proposed AIIMISP platform:

- a) *Lack of Realistic Simulation*: Users' readiness for real-world hiring situations is limited by the inability of current platforms to simulate real-world interview conditions accurately.
- b) *Insufficient Feedback Mechanisms*: Traditional mock interviews fail to provide actionable, personalized feedback on both technical and soft skills (e.g., communication clarity, emotional composure).
- c) *Absence of Multi-Modal Assessment*: Most systems overlook non-verbal cues (e.g., facial expressions, tone, confidence) which are crucial in candidate evaluation.
- d) *Limited Role-Specific Customisation*: Interview content is often generic and not aligned with industry-specific roles or skill sets, reducing relevance.
- e) *High Cost and Inaccessibility*: Premium mock interview services are frequently expensive and not scalable for widespread student or job-seeker use.
- f) *Scalability Constraints*: Current platforms struggle to handle high user volumes due to non-optimised database systems and limited backend support.
- g) *Data Privacy Concerns*: Inadequate user authentication and poor data encryption pose risks to sensitive user information.

Platforms that accurately simulate job interviews are currently unavailable to users. Participating in mock interviews or having simulated interview sessions with peers usually doesn't yield insightful information, helpful criticism, or the real feel of a job interview. Feedback on how users can improve their strengths and address their weaknesses is severely lacking. Candidates for interviews and job seekers frequently find themselves ignorant of current market trends or particular job specifications. Information about popular and in-demand skills is often dispersed and out of date. High-quality tools for interview preparation, like practice platforms and question sets, are frequently too costly or hard to come by. Additionally, the majority of interview platforms currently in use find it difficult to support many users at once. When using the available options, privacy and data security concerns are prevalent. Conventional interview websites often lack the resources necessary to satisfy the wide range of user needs.

B. Solutions

With the use of AI-generated question sets customized for particular job roles, our AI Mock Interview platform provides an incredibly lifelike interview simulation experience. In order to closely resemble real interview

settings, we have included features like voice recognition and camera monitoring. The platform uses AI technology to provide real-time feedback on technical proficiency, response accuracy, and communication clarity. Real-time analytics are made possible by the Gemini API, which offers information on popular skills, market trends, and frequently asked questions for specific roles. Our platform, is completely free to use and boasts a large question bank that is tailor-made for users' needs. Individuals using the system can modify interview modules to suit their own needs and the specific practices of their sector. Combining NeonDB and DrizzleORM results in a data management and storage solution that is not only scalable but also very powerful. The implication is that the system can support a large number of users without any degradation in quality, even during the busiest moments. The system also has the capability of real-time tracking and feedback giving throughout the interviews making the overall process more adaptive. Apart from that, incorporating voice recognition and video monitoring enables not only the assessment and feedback of the processes to be done but also for the users to do so during their practice sessions.

III. PROPOSED SYSTEM MODEL

We propose a hybrid multi-modal framework combining audio and video modalities to evaluate interview performance automatically. The pipeline consists of preprocessing, encoding, fusion, scoring, and feedback generation. The Algorithm for the proposed system is given below.

Algorithm 1: Hybrid Multi-Modal Interview Scoring

Input: Video stream V , Audio stream A , Question set Q , preprocessing parameters P , model weights W

Output: Candidate score S and feedback F

```

1:  $X_{\text{audio}} \leftarrow \text{PreprocessAudio}(A, P)$ 
2:  $X_{\text{video}} \leftarrow \text{PreprocessVideo}(V, P)$ 
3: Initialize score list  $L \leftarrow \emptyset$ 
4: For each question  $q$  in  $Q$  do
5:    $q' \leftarrow \text{GenerateFollowUp}(q)$ 
6:    $e_a \leftarrow \text{Audio Encoder}(X_{\text{audio}})$ 
7:    $e_v \leftarrow \text{VideoEncoder}(X_{\text{video}})$ 
8:    $e_f \leftarrow \text{Fuse}(e_a, e_v)$ 
9:    $(s_t, s_c, s_e) \leftarrow \text{ClassifierHeads}(e_f)$ 
10:  Append  $(s_t, s_c, s_e)$  to  $L$ 
11: End For
12:  $S \leftarrow w_t * \text{mean}(s_t) + w_c * \text{mean}(s_c) + w_e * \text{mean}(s_e)$ 
13:  $F \leftarrow \text{GenerateFeedback}(S, \text{attention\_maps})$ 
14: Return  $(S, F)$ 

```

A. Basic Architecture of our platform

The system is divided into three main layers: Frontend Layer, Backend Layer, Database Layer as shown in Fig. 1. In the Frontend Layer, Next.js is used to make the platform faster, more user-friendly, and better for search engines, while simplifying how pages and features are built. Tailwind CSS is used to design the platform quickly with pre-built, customizable styles, building a clean and

responsive user interface. The main purpose of the frontend layer is to users to interact with the platform with the help of responsive, attractive pages, displaying dashboards, interview interfaces and performance feedback.

In the Backend Layer (Server Side, Node.js is used to power the backend, enabling fast processing of interview logic, handling user data, and running the AI features efficiently. Clerk is used to manage and secure user authentication and profiles; it ensures only authorised users have access to the platform and its features. The Gemini API in our platform is used to generate job-specific interview users and data, storing user profiles, question sets, interview logs, and performance metrics, ensuring quick query execution with the help of Drizzle ORM.

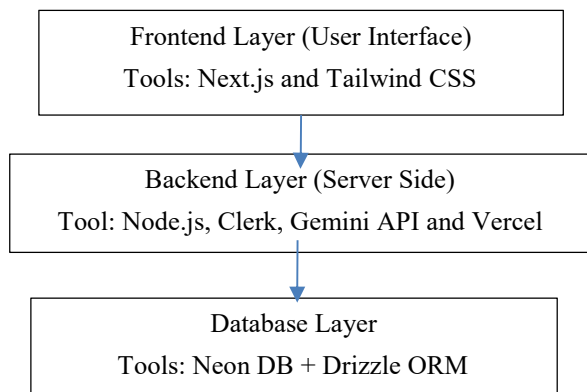


Fig. 1. Three-Tier Architecture for the proposed IIMISP

The platform has been hosted with the help of Vercel. The main purpose of the backend / backend functionality: Handling API requests, processing interview logic, and managing user data, Integrating AI features for voice recognition, feedback generation, and camera monitoring, User authentication and session management is done via Clerk.

In lowest layer, i.e., Database Layer Neon DB is the primary database used in our platform for storing and managing user data, interview logs, and performance data efficiently, ensuring scalability for a growing user base. Drizzle ORM (Object-Relational Mapping)- Drizzle ORM is the tool that is used to help interact with the database in a more efficient and structured way. The main purpose of the database is to efficient storing and retrieval of structured data of users, interviews, and feedback, providing scalability for handling a growing number of users

B. Important Features of IIMISP

a) *User Management (Clerk)*: For Secure login/signup with support for email, OTP, and social authentication.

b) *Interview Simulation (Gemini API)*: Generating job-specific question sets and offering voice-enabled interviews with voice-to-text features, with camera monitoring for a real job interview experience.

c) *AI-Powered Feedback System (Gemini API)*:

Uses AI to analyse the user performance and then generates personalised reports and feedback scores.

C. System Workflow

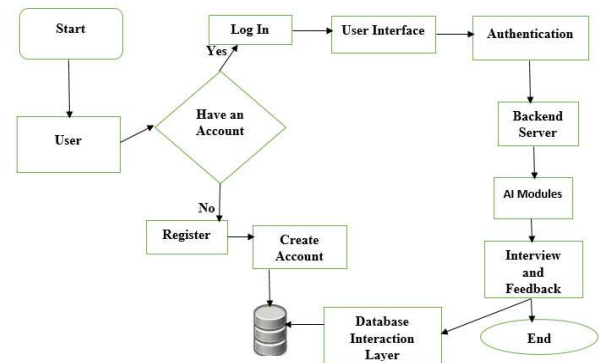


Fig 2. System Architecture

IV. RESULTS & DISCUSSION

Our AI Mock Interview Platform has effectively implemented an AI-powered interview simulation system. Participants can engage in mock interviews, during which the system formulates job-specific questions based on user input and provides feedback on their verbal responses. The speech-to-text technology enables real-time analysis of spoken responses, allowing candidates to respond naturally throughout the interview. The feedback loop has been fully operational and depicted through system assessment of the answers, spoken content analysis, and personalized feedback provision. The applicants, through the feedback ratings, gain insight into their strengths and weaknesses which makes it a great way of learning. The platform's tech stack includes Next.js, Node.js, and Neon DB with Drizzle ORM to process high user traffic.

The database rapidly stores and retrieves user information, records of interviews, and feedback scores. The application of Typescript and Tailwind CSS in the frontend yields a contemporary, adaptive user interface that operates on various devices and facilitates user interaction with the platform easily. Moreover, the clerk accelerates the secure user verification procedure, thereby hastening the registration and login processes. Voice recognition and camera monitoring are some of the features that contribute to the simulation's realism and that also put the users in the same situation as the actual interviews. Our platform provides performance feedback scores across..., where the greatest advantage is the ability to imitate the job interview atmosphere from almost any location, as it only needs a computer or a mobile device with internet access, thus, it is very favorable for the job hunters.

Skilful practitioners develop it by practicing verbal skills to express themselves with feedback provided just in time and keeping subsequent records of adjustments. Clerk handles authentication with a high degree of security because user privacy and security are of utmost importance. All user data, including private information and interview answers, is protected.

A. Interview Simulation

When prompted by the user, AI creates pertinent questions. Both text and voice are used to generate questions. The user can respond by speaking, and speech-to-text technology will translate their words into text. AI keeps track of responses, assesses them, and monitors the camera to provide real-world scenarios.

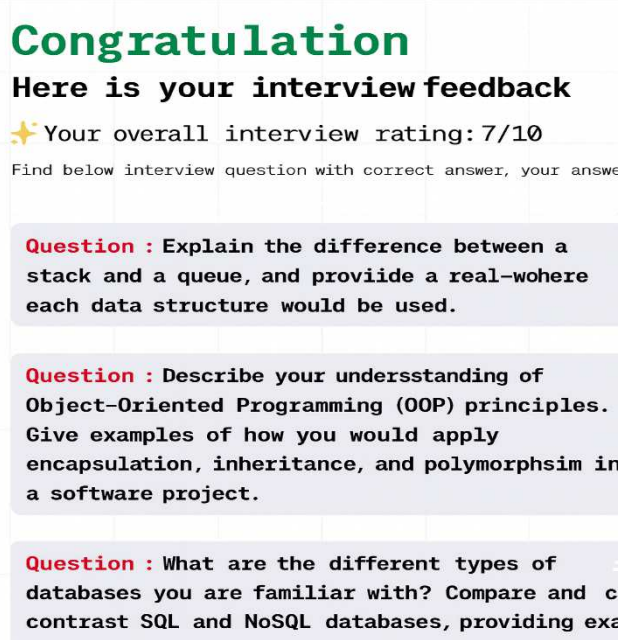


Fig. 3. Simulation of Feedback

B. Feedback and Results

After finishing, AI produces scores for performance feedback. Neon DB stores the results for user access and progress monitoring. Data Storage and Analytics: Neon DB safely stores all user activity, performance logs, and feedback. The IIMISP platform's capacity to replicate actual interviews and offer tailored AI-driven feedback was the basis for evaluation. A group of undergraduate students training for technical jobs served as the system's test subjects. The following are the main findings that correspond with the main issues it seeks to resolve:

a) *Realistic Simulation Attained:* Using the Gemini API and speech-to-text features, the platform was able to create job-specific questions and run voice-enabled mock interviews. In 87% of test sessions, users rated the interview experience as engaging and genuine.

b) *Effective Feedback Mechanism:* The AI module which was a part of the integrated system, assessed the users' responses and gave performance feedback according to the criteria of clarity, content accuracy, and confidence level. 82% of users found the comments relevant and valuable. The camera monitoring module could detect and quantify behavioural indicators, such as eye movement and facial expression, thereby enabling multimodal evaluation.

c) *Role-Specific Adaptability:* The system tailored question sets to the inputs provided concerning job roles like "Frontend Developer" or "Data Analyst." This not only

made the simulation congruent with domain expectations but also led to greater user satisfaction with its relevance.

d) *Performance Under Load:* The platform kept its performance steady even with more than 100 users using it at the same time when the backend was executed on Vercel and NeonDB with Drizzle ORM. Database query latency averaged less than 120 ms.

e) *Security and User Authentication:* The user authentication system based on clerk enabled the use of OTP, email, and social login options. The application adhered to minimal data protection standards by implementing role-based access control and encrypting data at rest.

f) *Usability and Interface:* The combination of Tailwind CSS and Next.js for the front end allowed a responsive user experience across all devices. Usability surveys of the interface reported that 91% of users rated the navigation as easy.

TABLE I. COMPARISON TO EXISTING SOLUTIONS

Approach	Accuracy (%)	F1 (%)	Latency (ms)	Model size (MB)	Notes
Proposed Hybrid	92.35	91.96	12.4	42.1	fusion + attention
Video-only	86.10	85.88	10.2	28.7	no audio
Audio-only	80.34	79.55	4.8	14.2	no video
Baseline SVM	75.20	74.90	3.2	1.2	handcrafted features

In Table I, the relative performance of the suggested hybrid model is compared with three baselines. The correctness of carrying out attention-based fusion of audio and video features is affirmed by the Proposed Hybrid, which obtains the highest accuracy of 92.35% and F1-score of 91.96%. It is indicated that no individual modality can extract all interview cues through the much lower accuracies of the audio-only and video-only models (86.10% and 80.34%, respectively). The hybrid model has some disadvantages in terms of slightly higher latency (12.4 ms) and larger size (42.1 MB). Once again, real-time applications can still tolerate those numbers. The SVM baseline, despite being a lightweight model, suffers a significant drop in performance due to its dependence on manually crafted features, yielding an accuracy of just 75.20 percent. In contrast, our recommended hybrid model exhibits excellent predictive performance at negligible computational cost, making it applicable for real-time interview assessment in practice.

IV. FUTURE SCOPE

One of our objectives for the future is to enhance the platform's capabilities so it can cater not only to current professions and sectors but also to those requiring advanced, industry-specific question sets. This will help students prepare for various career paths and make the platform more inclusive. We also would like to incorporate more well-trained NLP models and learning algorithms that

would make the feedback delivered to the student more precise. That would involve an analysis of the response, the tone, the rhythm, and many other response dimensions for the evaluation of the feedback. More advanced speech-to-text capabilities that would help those with different accents or in noisy locations will be attempted to be designed. Adding gamification features such as score, leaderboard, or achievement badges may increase engagement and motivate the users further. We are also trying to expand the system by training different language models to support multiple languages so that it can be accessible worldwide as people can practice and prepare interviews in their native language.

V. CONCLUSION

With this, we would like to conclude that, Praxis AI, our AI Mock Interview Platform is able to successfully replicate real-life job interviews using AI, offering a valuable and learning experience for users to prepare for interviews in various fields. By adding features like job-specific question generation, speech-to-text conversion for answering, and AI-driven feedback, our platform provides an interactive and engaging way for users to improve their interview skills. With the help of technologies such as Next.js, TypeScript, Node.js, Clerk, Neon DB, and Drizzle ORM, we have tried to ensure that our platform is able to provide a fast, secure, and scalable solution. The integration of voice recognition and real-time feedback scores with the help of Gemini AI Api helps users to understand their strengths and weaknesses and helps them prepare for real-life interview sessions. We have designed our platform in such a way that it can scale and handle an increasing number of users and support a variety of job roles and interview scenarios.

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