International Journal of Scientific Research and Engineering Development-– Volume 9 Issue 2, Mar-Apr 2026
Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

PrepMate: AI Based Interview Preparation Platform

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Abstract:

In today's job market, students and fresh graduates face a huge challenge when it comes to preparing for interviews. Most of them practice on their own or rely on friends for mock interviews, which does not give them any real feedback on how they actually come across during an interview. There is a clear gap between what candidates know and how well they perform under pressure. PrepMate is a web-based platform developed to solve this problem by combining subject-knowledge quizzes, AI-generated mock interviews, real-time emotion detection, and detailed analytics — all in one place. The system is built using React and TypeScript on the frontend, with Supabase handling the backend database and authentication. For AI, the Google Gemini API is used to generate quiz questions and interview questions tailored to a user's profile. The emotion detection is implemented using the face-api.js library, which runs directly in the browser, meaning no data is sent to any external server for face analysis. The platform has four main modules: a Mock Quiz module, a Mock Interview module, an Analytics module, and the Emotion Detection feature integrated into the interview.

Keywords *— Interview preparation, emotion detection, mock quiz, AI questions, face-api.js, Gemini API, React, TypeScript, Supabase, real-time analysis, confidence scoring.*

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I. INTRODUCTION

The rapid growth of digital job markets has significantly increased the demand for effective interview preparation tools. Students and fresh graduates often struggle to prepare adequately because traditional methods — such as self-study, peer mock interviews, or watching tutorials — lack structured evaluation and real-time feedback, especially regarding non-verbal communication. Almost no single platform combines subject-based quizzes, mock interviews, and behavioral analysis in one place.

PrepMate addresses these challenges through a unified web-based platform that leverages AI to generate personalized quiz and interview questions, detect facial emotions in real time using the user's webcam, and provide detailed analytics to track progress over time. A key design choice was keeping all face analysis local in the browser, ensuring user privacy by not transmitting webcam data to any external server.

Background and Motivation

Common interview preparation methods include reading textbooks and hoping the same questions appear, asking friends for informal mock interviews, and watching YouTube videos without hands-on practice. None of these provide structured, personalised, or honest feedback — especially regarding non-verbal communication such as facial expressions, eye contact, and nervousness, which are critical in real interviews.

Project Objectives

Build a quiz system that generates questions using AI based on the user's profile

Create an AI-powered mock interview with different interview types (Technical, HR, Behavioural, General)

Implement real-time emotion detection during interviews using the user's webcam

Show detailed analytics so users can track their progress over time
Keep all face analysis local (in the browser) for privacy

II. LITERATURE REVIEW

Ekman and Friesen [1] proposed the Facial Action Coding System (FACS), which forms the foundation of modern facial expression recognition by identifying facial muscle movements (action units) used today in systems like PrepMate. Goodfellow et al. [2] demonstrated the use of Convolutional Neural Networks (CNNs) for facial expression recognition using the FER2013 dataset, showing how deep learning significantly improves emotion detection accuracy.

Smilkov et al. [3] introduced TensorFlow.js, enabling machine learning models to run directly in the browser. This work supports PrepMate's client-side emotion detection approach without sending video data to servers. Soukupova and Cech [4] proposed the Eye Aspect Ratio (EAR) method for detecting eye movements and blinking, a concept adapted in PrepMate to estimate eye contact during interviews.

Kleinke [5] studied the importance of eye contact in communication, proving that gaze behavior directly affects confidence and engagement, supporting the inclusion of eye contact scoring in the system. DeGroot and Motowidlo [6] explored how verbal communication features such as speech fluency influence interview performance, supporting the use of speech rate evaluation in assessing candidate confidence.

Hickman et al. [7] analyzed AI-based interview systems and showed that speech and behavioral cues can predict interview outcomes, validating the integration of speech and emotion analysis in PrepMate. Brown et al. [9] introduced large language models demonstrating their ability to generate human-like text, supporting AI-based interview question generation. Kurdi et al. [10] reviewed automatic question generation systems, showing that AI can generate high-quality questions comparable to human-created ones.

III. PROBLEM STATEMENT

Before the development of intelligent interview preparation systems, students and job seekers faced multiple challenges. Traditional methods lack structured evaluation and real-time feedback, especially in terms of non-verbal communication and behavioral performance. The key problems identified are:

Lack of Integrated Preparation Platform: No single system combines subject-based quizzes, mock interviews, and behavioral analysis in one unified platform.

Absence of Real-Time Feedback: Existing solutions fail to provide immediate insights into a candidate's performance during mock interviews.

Neglect of Non-Verbal Communication: Most platforms do not evaluate facial expressions, eye contact, or confidence levels, which are critical in real interviews.

Inefficient Progress Tracking: Users lack proper analytics to monitor improvement in both technical knowledge and interview performance.

Privacy Concerns: Many emotion analysis tools require server-side processing of webcam data, raising serious privacy and data security issues.

IV. SYSTEM ARCHITECTURE

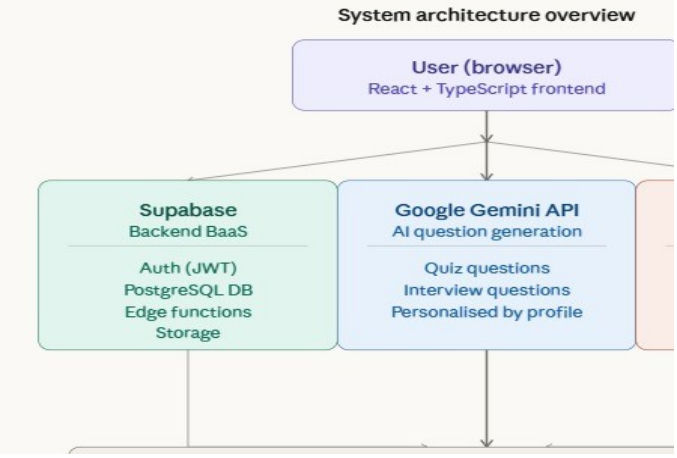

Figure 1. High level system architecture of PrepMate

A. Frontend (React + TypeScript)

The entire user interface is built with React 18 and TypeScript using Vite as the build tool. Tailwind CSS combined with shadcn/ui components provides professional-looking UI elements. React Router v6 handles navigation

between pages: Home/Landing, Dashboard, Quiz, Interview, Analytics, and User Profile.

B. Supabase (Backend as a Service)

Instead of building a custom backend, Supabase is used as an open-source Firebase alternative. It provides a PostgreSQL database for storing quiz attempts, interview sessions, and user profiles; JWT-based authentication; Edge Functions in TypeScript/Deno as a secure middle layer between frontend and the Gemini API; and Row Level Security (RLS) to ensure users can only access their own data.

C. Google Gemini API (AI Engine)

Google Gemini API is integrated for generating quiz questions and interview questions. Requests are made through Supabase Edge Functions, not directly from the browser, so the API key is never exposed to the client. The prompt includes the user's job role, experience level, industry, and skills, making questions feel personalised.

D. face-api.js (Emotion Detection)

face-api.js is a JavaScript library that runs pre-trained neural network models directly in the browser. Three models are loaded: TinyFaceDetector (for finding the face), FaceLandmark68Net (for identifying 68 facial landmarks), and FaceExpressionNet (for classifying emotions). The key benefit is privacy — the webcam feed never leaves the user's device.

V. MODULE DESCRIPTIONS

A. Module 1: Mock Quiz

The Mock Quiz module allows users to pick from various skill categories such as Data Structures, Python, and DBMS. The system calls the backend Edge Function, which uses the Gemini AI to create 10 multiple-choice questions tailored to the user's profile. Each question comes with four options, the correct answer index, and a brief explanation. The quiz has a 15-minute countdown timer with auto-submit. All results are saved to the database for analytics.

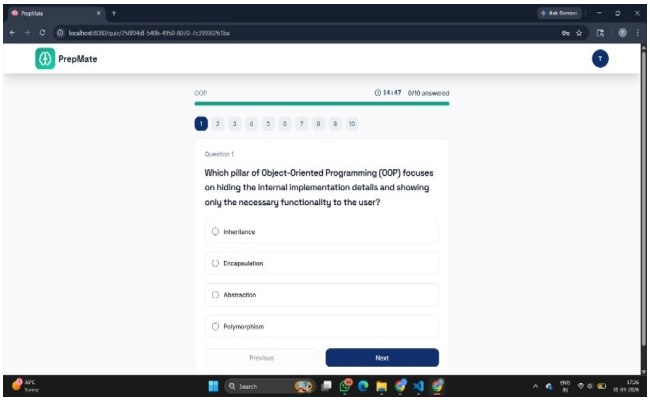

Figure 2. Mock Quiz interface

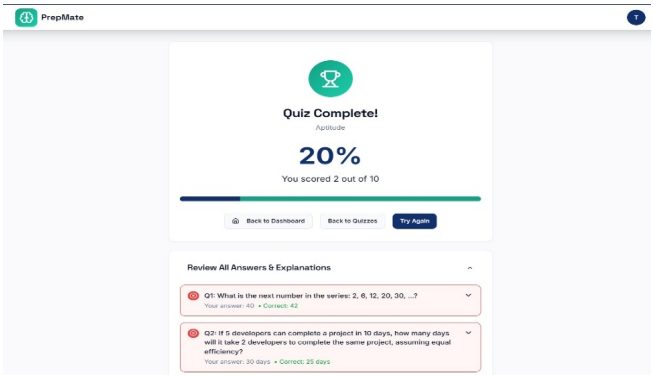

Figure 3. Mock Quiz result with explanation

B. Module 2: Mock Interview

The Mock Interview module is the core of the project. The user enters their target job role and selects the interview type. After enabling the camera and microphone, Gemini generates five interview questions based on the type and job role. For each question, the user speaks their response while the Web Speech API converts speech to text in real time. face-api.js runs in the background every 500 milliseconds, analysing the webcam feed to calculate confidence, eye contact, and nervousness scores.

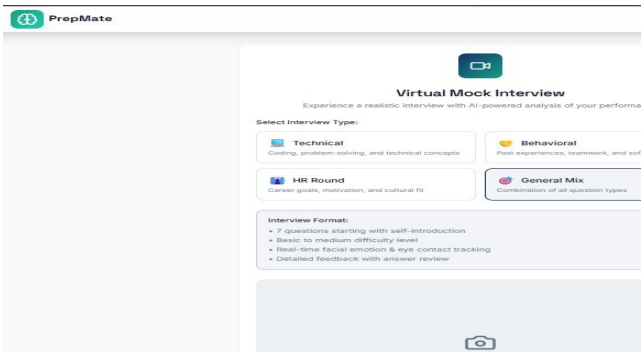

Figure 4. Interview page

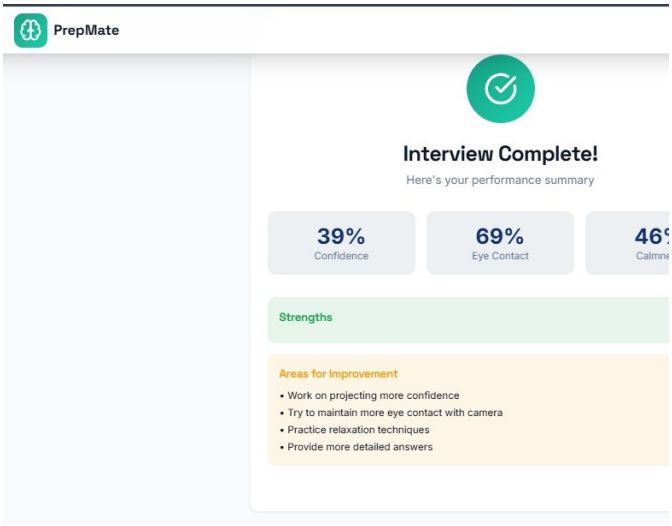

Figure 5. Interview Performance Result

C. Module 3: Emotion Detection During Interview

This module runs silently in the background during the interview. The Confidence Score is calculated by combining a facial score (positive weight to happy/neutral expressions, negative weight to fearful/sad/angry) and a speech score that checks words-per-second rate. The Eye Contact Score is based on how centred the face is in the frame and the Eye Aspect Ratio (EAR). The Nervousness Score is simply 100 minus the confidence score.

D. Module 4: Analytics

The Analytics page pulls all historical data — quiz scores and interview session data — and displays them as charts and summaries using the Recharts library. An Improvement Suggestions component gives the user tips based on their patterns.

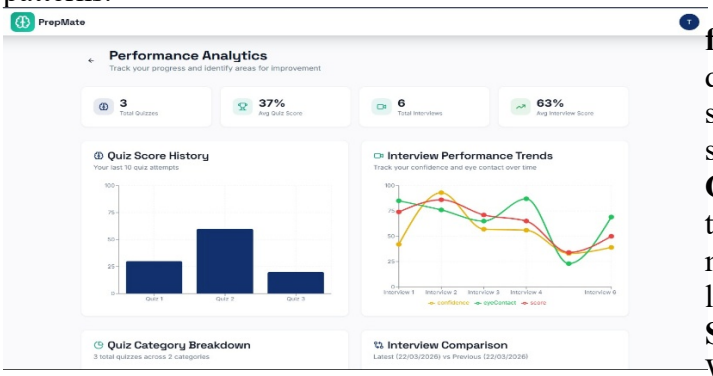

Figure 6. Performance analytics (quiz and interview)

VI. IMPLEMENTATION DETAILS

Frontend: React 18, TypeScript, Vite, Tailwind CSS, shadcn/ui

Backend: Supabase (PostgreSQL, Edge Functions, RLS, JWT Auth)

AI Engine: Google Gemini API (via Supabase Edge Functions)

Emotion Detection: face-api.js (TinyFaceDetector, FaceLandmark68Net, FaceExpressionNet)

Speech Recognition: Web Speech API (Chrome)

Charts: Recharts library

Deployment: Web-based, accessible from any modern browser

VII. APPLICATIONS

Campus Placement Preparation: Final year students can use the platform to practice coding round preparation (quizzes on DSA, OS, DBMS) and interview rounds (HR, technical, managerial). Emotion detection helps them become aware of nervous habits before placement day.

Career Switchers: Someone switching fields can set their profile accordingly and get questions relevant to their target role, with AI adapting difficulty to their declared experience level.

College Training and Placement Cells: T&P officers can recommend the platform to all students. Since it is web-based, no installation is required.

Soft Skills Development: The emotion detection component makes it useful for general public speaking improvement, not just interview prep.

VIII. CHALLENGES AND LIMITATIONS

face-api.js Model Loading Time: The face detection models are about 15 MB in total. On a slow internet connection, loading them takes several seconds.

Gemini API Response Inconsistency: Sometimes the Gemini API returns JSON wrapped in markdown code fences, requiring extra cleaning logic before parsing.

Speech Recognition Browser Differences: The Web Speech API works well on Chrome but has issues on Firefox and Safari.

Emotion Detection in Poor Lighting: face-api.js models were trained on well-lit images; in low-light environments, detection rate drops significantly.
Only five questions are generated per interview session, which may not be enough for thorough practice.
The platform currently works best on desktop or laptop with a proper webcam. Mobile support is limited.

IX. FUTURE WORK

Voice Analysis: Integrate real-time audio analysis detecting speech rate, volume, and filler words for more accurate nervousness scoring.
Head Pose Estimation: Add head pose detection to significantly improve eye contact scoring.
More Interview Questions: Increase from 5 to 10 or 15 questions per session with user-selectable count.
Peer Review Mode: Allow two users to interview each other with emotion analysis for both participants.
Resume Parser: Add a feature to upload a resume and auto-fill the user profile with extracted skills and experience.
Offline Mode: Cache AI models in the browser using Service Workers so users do not re-download them every session.

X. CONCLUSION

This paper presented PrepMate, an AI-based interview preparation platform that combines AI-generated quizzes, AI-powered mock interviews, real-time emotion detection, and detailed analytics in one privacy-friendly web application. The fact that all face analysis runs entirely in the browser without sending any data to a server was an important design choice that addresses major privacy concerns present in existing emotion analysis tools.

The system successfully integrates multiple complex technologies — React, Supabase, Google Gemini API, and face-api.js — into a single cohesive platform. Feedback from student users confirmed that the core idea works: users became more conscious about eye contact and speaking pace after using the system. Future improvements include adding voice tone analysis, increasing the number of interview questions, and conducting formal studies to measure actual improvement in interview performance.

ACKNOWLEDGMENT

We thank our guide Prof. Shraddha N. Utane and the Department of Information Technology, Shri. H.V.P.M. COET, Amravati for their continuous guidance and support throughout this project.

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