

An AI-Powered Career Readiness Ecosystem for Campus Placements

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Abstract: Campus placement preparation is a crucial phase in a student's academic journey; however, the current ecosystem is highly fragmented, requiring students to depend on multiple platforms for aptitude practice, coding preparation, resume building, and interview training. This lack of integration leads to inefficiencies, poor progress tracking, and difficulty in assessing overall readiness. Students often struggle to identify their weaknesses due to the absence of centralized feedback, while Training and Placement Officers (TPOs) lack real-time insights into student performance, and recruiters face challenges in evaluating candidates holistically. To address these limitations, this paper proposes PrepWise AI, an AI-powered career readiness ecosystem that integrates all aspects of placement preparation into a unified, intelligent platform. The system combines aptitude and coding assessments, AI-proctored mock interviews, and ATS-based resume analysis within a single web-based environment, enabling a seamless and structured learning experience. It leverages Artificial Intelligence and Machine Learning techniques to provide personalized recommendations, adaptive testing, and predictive performance analytics. Additionally, the platform offers real-time dashboards for TPOs, allowing continuous monitoring of student progress, while recruiters gain access to structured candidate profiles and intelligent shortlisting based on skill proficiency, consistency, and behavioral insights. Built on a scalable cloud-based architecture, the system ensures high availability, secure data handling, and efficient performance under concurrent usage. By centralizing preparation, evaluation, and recruitment processes, PrepWise AI bridges the gap between academic learning and industry expectations, ultimately improving placement success rates, reducing recruitment time, and enhancing overall efficiency for students, institutions, and recruiters.

Index Terms: Artificial Intelligence (AI), Campus Placement System, Mock Interviews, ATS Resume Analysis, DSA Practice, Face Detection Proctoring, Performance Analytics, Cloud-Based Platform.

I. INTRODUCTION

Campus placements serve as a vital link between academic institutions and industry, providing students with employment opportunities while enabling recruiters to identify skilled talent. In the modern job market, companies expect candidates to possess not only technical expertise but also strong analytical thinking, communication skills, and adaptability. However, traditional placement preparation methods are highly fragmented, requiring students to use multiple platforms for aptitude practice, coding challenges, resume creation, and interview preparation. This lack of integration leads to inefficiencies and makes it difficult for students to evaluate their readiness in a holistic manner.

One of the major challenges faced by students is the absence of a unified system that tracks their progress across different domains. For instance, a student may perform well in coding but lack aptitude skills or communication abilities, yet there is no centralized mechanism to identify and address such gaps. Additionally, the lack of personalized guidance often results in inefficient preparation strategies, where students spend time on areas that may not significantly improve their placement chances.

Training and Placement Officers (TPOs) also encounter difficulties in managing large volumes of student data. Without centralized analytics, it becomes challenging to monitor individual progress, identify top performers, or provide targeted support to struggling students. Recruiters, on the other hand, rely heavily on resumes and basic test scores, which may not accurately represent a candidate's true potential. This can lead to inefficient hiring processes and missed opportunities for both candidates and organizations.

With the rapid advancement of Artificial Intelligence (AI), Machine Learning (ML), and data analytics, there is an opportunity to transform the placement preparation ecosystem into a more intelligent and data-driven system. AI can be used to analyse student performance, predict outcomes, provide personalized recommendations, and automate evaluation processes.

To overcome these challenges, this research proposes PrepWise AI, a comprehensive AI-powered platform that integrates all aspects of placement preparation into a unified ecosystem. The system offers personalized learning paths, real-time performance tracking, and intelligent feedback mechanisms, ensuring a structured and data-driven preparation process. By combining preparation tools, analytics, and recruitment insights, the platform aims to improve efficiency, transparency, fairness, and overall effectiveness in campus placements.

II. PROBLEM STATEMENT

Campus placement preparation faces several challenges due to the use of multiple disconnected platforms for aptitude tests, coding practice, resume building, and interview preparation. This fragmented approach creates confusion, inefficient progress tracking, and difficulty in evaluating overall student readiness.

- Students often lack personalized guidance and centralized performance analysis.
- Training and Placement Officers (TPOs) are unable to monitor student progress effectively in real time.
- Recruiters depend mainly on CGPA and limited assessment data for candidate shortlisting.
- Existing systems do not provide integrated analytics, AI-driven evaluation, or structured recruitment support.
- The absence of a unified platform leads to reduced preparation efficiency and missed placement opportunities..

Existing placement preparation systems operate independently, leading to poor coordination, limited performance insights, and inefficient recruitment processes. There is a need for a centralized and intelligent platform that integrates preparation, evaluation, and recruitment into a single ecosystem. Such a system should provide real-time analytics, AI-driven assistance, and scalable performance for students, TPOs, and recruiters.

III. MOTIVATION

The motivation for this project arises from the growing challenges faced by students during campus placement preparation due to the use of multiple disconnected platforms for coding practice, aptitude tests, resume building, and interview preparation. Existing systems often lack centralized progress tracking, personalized feedback, and real-time performance analysis, making it difficult for students to evaluate their readiness effectively. Additionally, Training and Placement Officers (TPOs) and recruiters have limited visibility into candidate skills and performance beyond academic scores.

This project aims to address these limitations by developing an AI-powered career readiness ecosystem that integrates preparation, evaluation, analytics, and recruitment support into a single platform. By combining AI-based mock interviews, ATS resume analysis, coding assessments, and performance tracking, the system provides a smarter, more efficient, and industry-oriented placement preparation

experience for students, institutions, and recruiters.

IV. OBJECTIVES

- Develop an integrated platform for placement preparation that eliminates the need for multiple tools.
- Provide AI-driven aptitude, coding, and interview modules for comprehensive preparation.
- Enable real-time performance tracking and advanced analytics for students and TPOs.
- Implement ATS-based resume evaluation using NLP techniques.
- Facilitate seamless communication between students, TPOs, and recruiters.
- Ensure scalability, accessibility, and usability across devices and platforms.
- Enhance decision-making through predictive analytics and performance insights.

V. HARDWARE AND SOFTWARE REQUIREMENTS

The proposed *PrepWise AI* system was implemented as a cloud-based full-stack web platform to support placement preparation, AI-driven assessment, and recruitment management under real-time operating conditions. The system integrates frontend, backend, database, and AI services to ensure efficient handling of coding practice, mock interviews, resume analysis, and performance tracking.

All core functionalities, including authentication, analytics, ATS-based resume evaluation, and interview management, are handled through the Node.js backend and MongoDB database. AI-powered features such as mock interview generation and response evaluation are integrated using the Google Gemini API, while specialized tasks like code execution and face detection are managed through Python FastAPI microservices using OpenCV.

The complete system was developed using HTML, CSS, JavaScript, Node.js, Express, Python, and MongoDB Atlas. Visual Studio Code was used as the development environment, while Vercel and Render were utilized for deployment and cloud hosting. Functional testing and integration testing were performed to validate system performance, scalability, and reliability under real-time usage conditions.

VI. METHODOLOGY

The proposed *PrepWise AI* system is developed using a modular full-stack architecture that integrates placement preparation, AI-driven evaluation, analytics, and recruitment support within a single intelligent platform. The methodology focuses on providing a centralized ecosystem for students, Training and Placement Officers (TPOs), and recruiters while ensuring scalability, real-time interaction, and efficient performance monitoring.

A. User Authentication and Role Management

The system implements secure authentication using Google OAuth 2.0 for students and role-based access control for administrators and companies. Separate dashboards and permissions are maintained for each user type to ensure secure and organized access to platform functionalities.

B. Aptitude and DSA Assessment Methodology

The aptitude and DSA modules are designed to evaluate technical and problem-solving skills through structured assessments. DSA questions are loaded from a dataset containing more than 3000 coding problems, while aptitude tests are dynamically generated in timed environments. User submissions are processed and stored to maintain performance history and analytics.

C. AI-Based Mock Interview System

The mock interview module utilizes the Google Gemini API to generate role-specific and topic-based interview questions dynamically. User responses are analyzed using AI-driven evaluation techniques to

provide feedback based on relevance, clarity, and technical accuracy. This approach enables personalized interview preparation and continuous improvement.

D. Resume Builder and ATS Analysis

The system includes a resume builder with predefined templates and PDF generation support. Uploaded resumes are analyzed using ATS-based evaluation methods by comparing resume content with job descriptions and required keywords. This helps students optimize resumes according to recruitment standards.

E. Real-Time Proctoring and Monitoring

A Python FastAPI microservice integrated with OpenCV is used for real-time face detection and interview proctoring. The system continuously monitors user presence during assessments and records violations such as absence or multiple-face detection, ensuring fairness and integrity during evaluation.

F. Backend and Database Integration

The backend is implemented using Node.js and Express, which manage APIs, user requests, analytics, and communication with AI services. MongoDB Atlas is used for storing user profiles, test results, interview sessions, resumes, and system logs. Optimized data handling techniques are applied to ensure fast response and reliable performance.

G. Cloud Deployment and Scalability

The platform is deployed using Vercel for the main application and Render for Python-based microservices. This cloud-based deployment ensures scalability, availability, and efficient handling of concurrent users under real-time operating conditions.

H. Testing and Validation

Functional testing, integration testing, and performance validation were carried out to ensure reliability and correctness of all modules. AI features, code execution, dashboard analytics, and proctoring mechanisms were tested under multiple usage scenarios to validate system stability and accuracy.

VII. RESULTS

The implementation of *PrepWise AI* demonstrates significant improvements in placement preparation, performance monitoring, and recruitment efficiency by integrating multiple preparation modules into a single intelligent platform. The system provides a seamless experience for students, Training and Placement Officers (TPOs), and recruiters through centralized analytics, AI-driven evaluation, and real-time assessment mechanisms.

- Students receive personalized feedback based on detailed performance analysis across multiple domains.
- TPOs can monitor student progress using centralized dashboards and analytics, enabling targeted guidance and efficient placement management.
- Recruiters gain access to structured candidate profiles with technical performance data, improving shortlisting and hiring decisions.
- AI-proctored assessments ensure fairness and reduce the possibility of malpractice during online tests and interview sessions.

A. User Authentication and Role-Based Access Validation

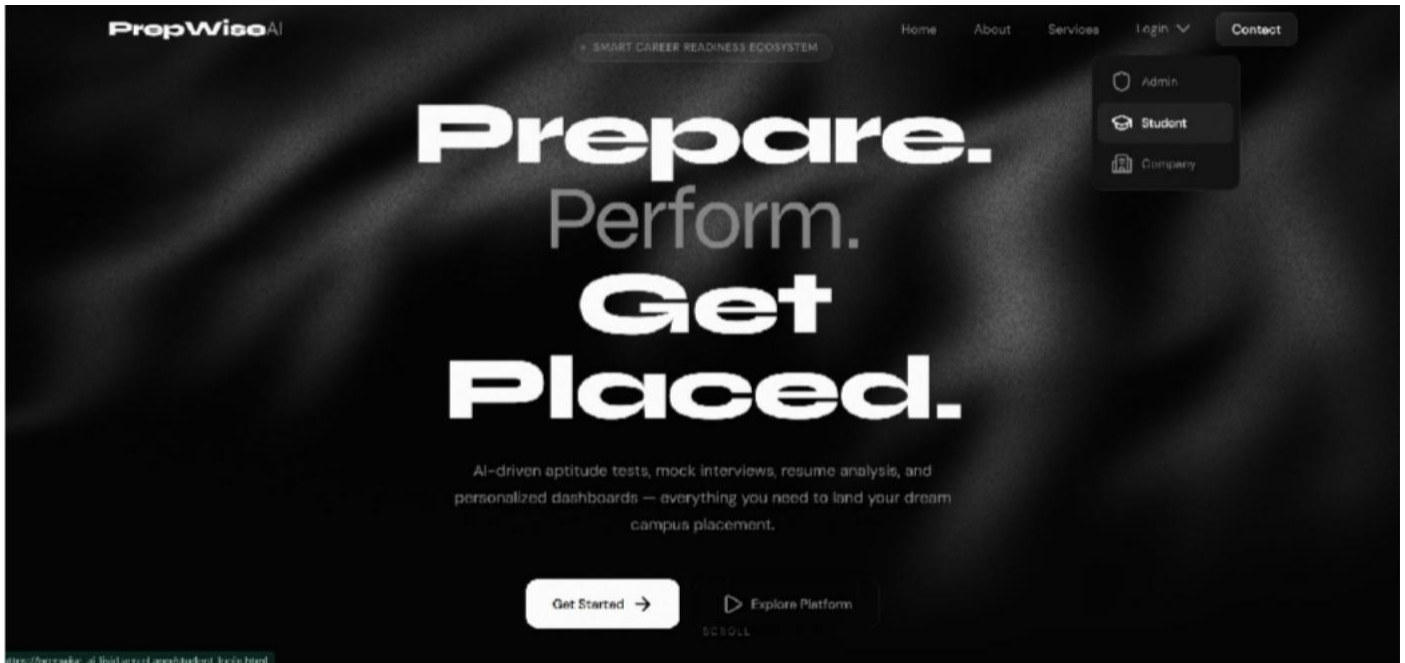


Fig. 1. Simulation and interface output showing login and role-based dashboard access

- Figure 1 illustrates the authentication workflow of the *PrepWise AI* system during normal operation. The login interface validates user credentials using Google OAuth and redirects users based on their assigned roles such as Student, Admin, or Company. The dashboard loading process confirms correct session handling and secure access management.
- The results demonstrate successful implementation of role-based access control, ensuring that each user type can only access authorized modules and functionalities within the platform.

B. Aptitude Quiz and Performance Analytics

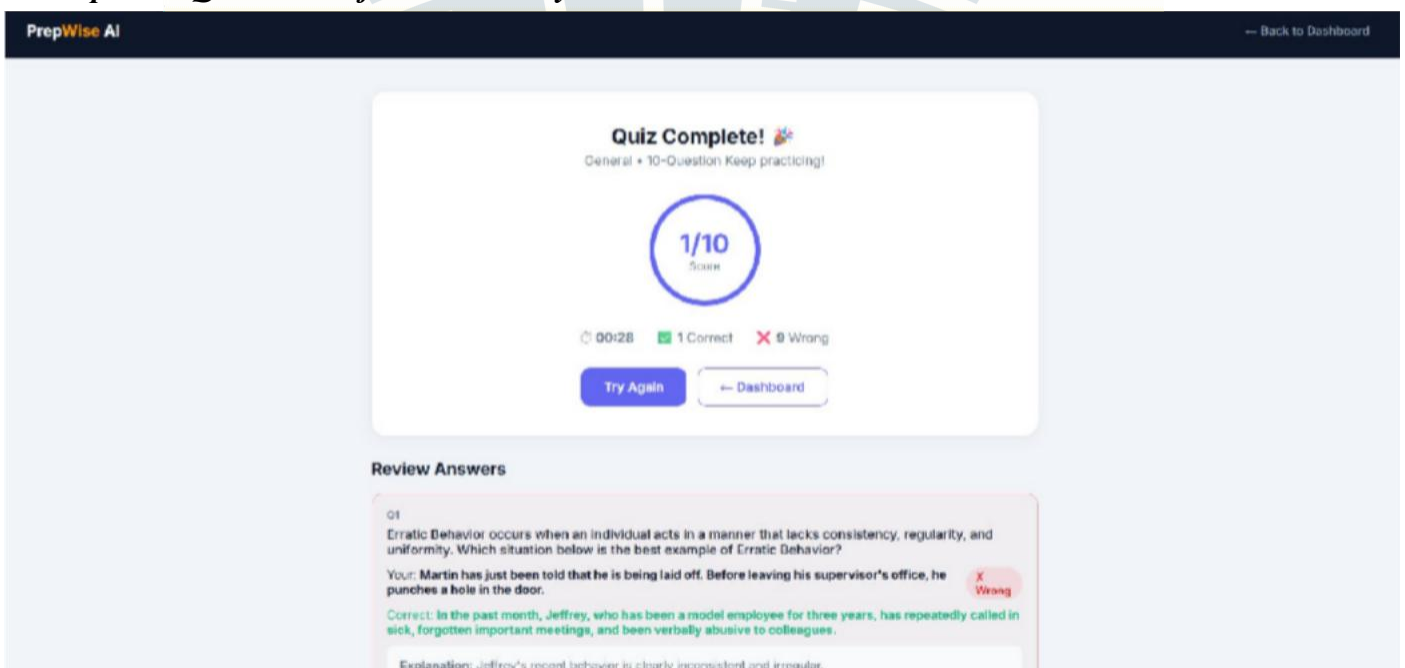


Fig. 2. Aptitude quiz result interface showing score, accuracy, and feedback after test completion

- Figure 2 presents the aptitude assessment module along with the result and feedback section generated after quiz completion. The system displays the obtained score, accuracy, attempted questions, and overall performance summary for the completed test session.
- Based on the user's responses, the platform provides automated feedback to help identify strengths and areas requiring improvement. The results confirm proper implementation of quiz evaluation, score calculation, and feedback generation within the system.

C. AI-Based Mock Interview and Proctoring System

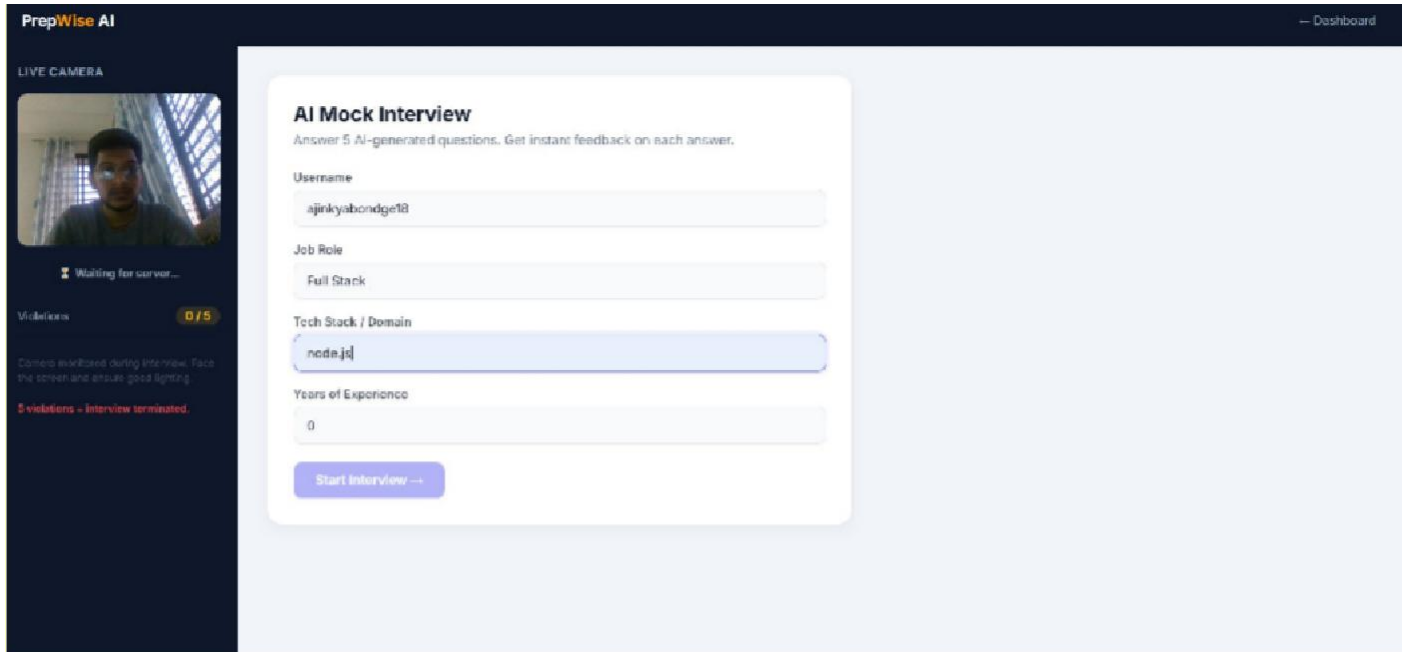


Fig. 3a. Real-time face detection and proctoring output during interview session

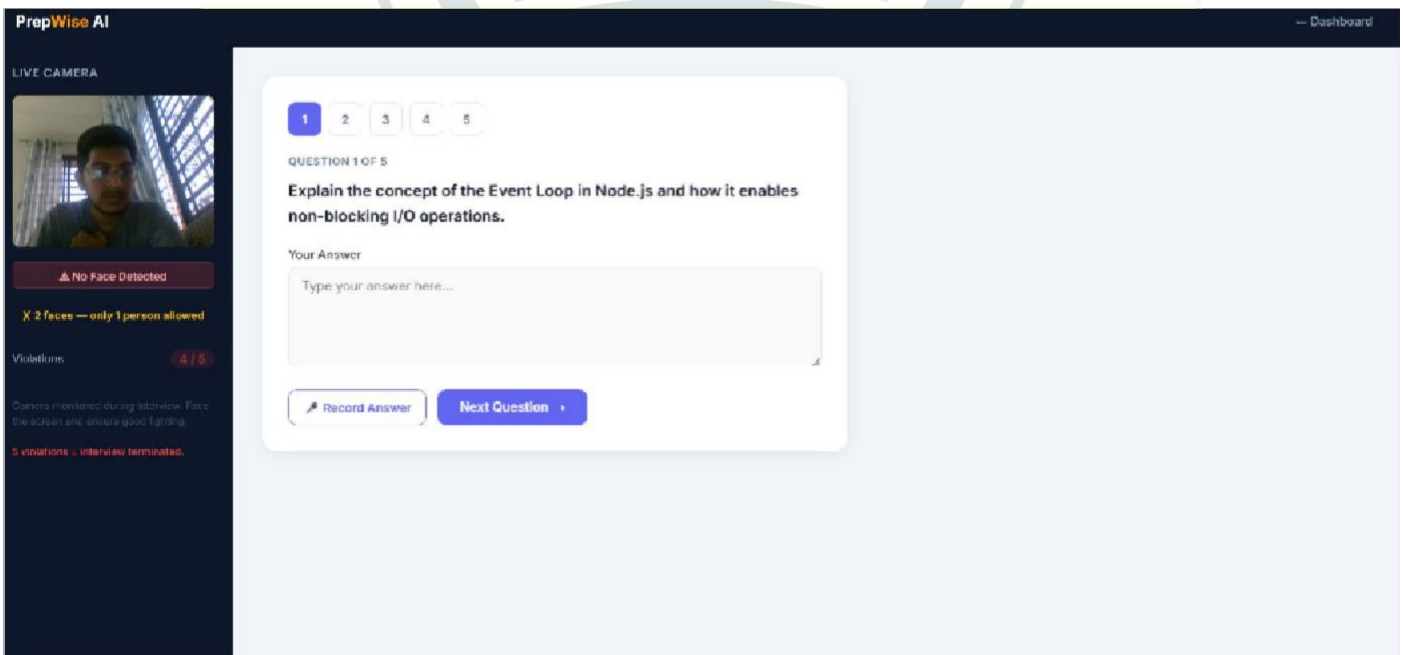


Fig. 3b. AI-generated mock interview interface with dynamic technical question generation

- Figure 3a shows the AI-powered interview module where technical and HR-based questions are dynamically generated using the Google Gemini API. User responses are evaluated to provide personalized feedback and performance insights.
- Figure 3b illustrates the real-time proctoring mechanism integrated with the interview process. OpenCV-based face detection continuously monitors user presence and records violations such as absence or multiple-face detection during the session.
- The results confirm reliable AI integration, accurate interview processing, and secure online assessment capabilities.

D. DSA Practice and Secure Code Execution

The screenshot displays the 'PrepWise AI - DSA Practice' interface. On the left, the 'Add Two Numbers' problem is described, involving linked lists. An example shows three linked lists: [2, 4, 3], [5, 6, 4], and [7, 0, 8]. The right side features a code editor with Python code for a solution and a terminal area showing the input and output.

Fig. 4. Coding interface showing problem statement, code editor, and execution results

- Figure 4 demonstrates the DSA practice environment integrated with secure code execution support. Users can solve coding problems using the in-browser editor and execute programs in multiple programming languages.
- Submitted code is processed through Python FastAPI microservices in a sandboxed environment, ensuring secure execution and output validation. The generated results confirm correct program execution, response generation, and performance tracking functionality.

E. Resume Builder and ATS Evaluation System

- Figure 5 illustrates the resume builder and ATS analysis module of the platform. Users can generate professional resumes using predefined templates and export them as PDF documents.
- The ATS evaluation system analyzes resume content against job descriptions and required keywords to generate compatibility scores and improvement suggestions. The results demonstrate efficient resume optimization and AI-assisted evaluation functionality.

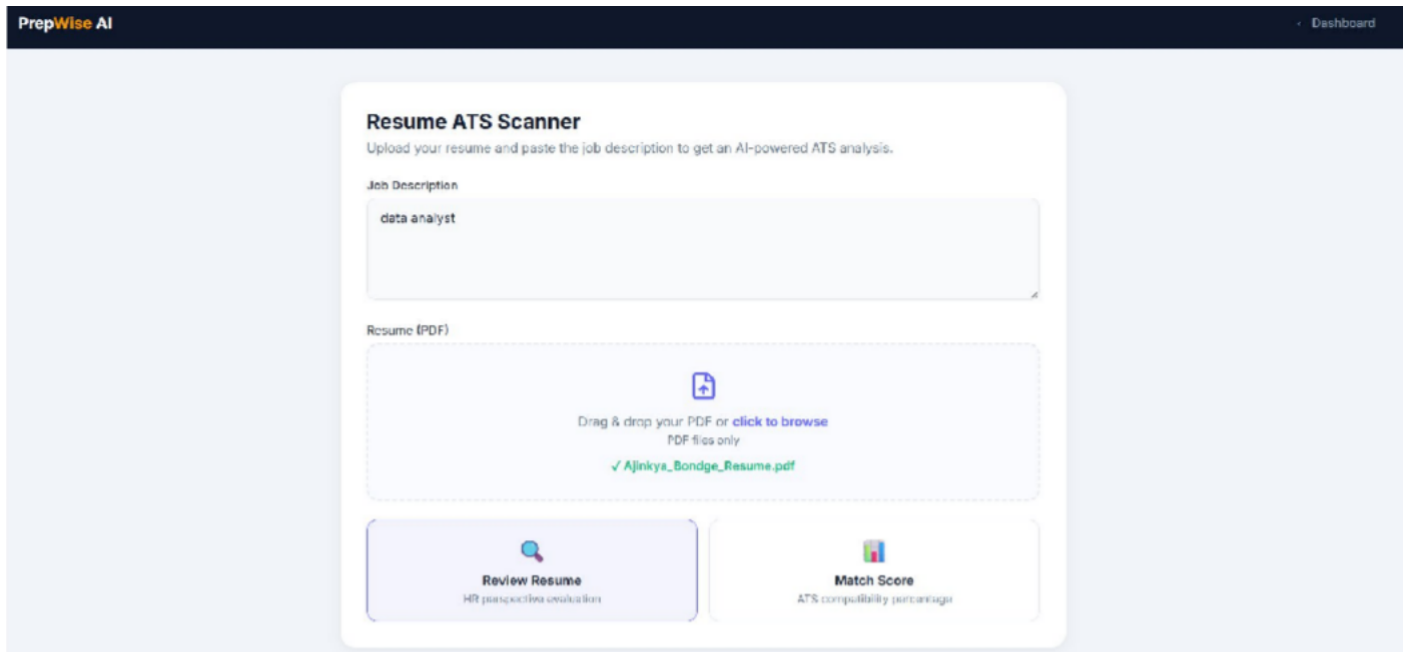


Fig. 5. Resume with ATS score and resume analysis report

F. Cloud Deployment and System Performance Validation

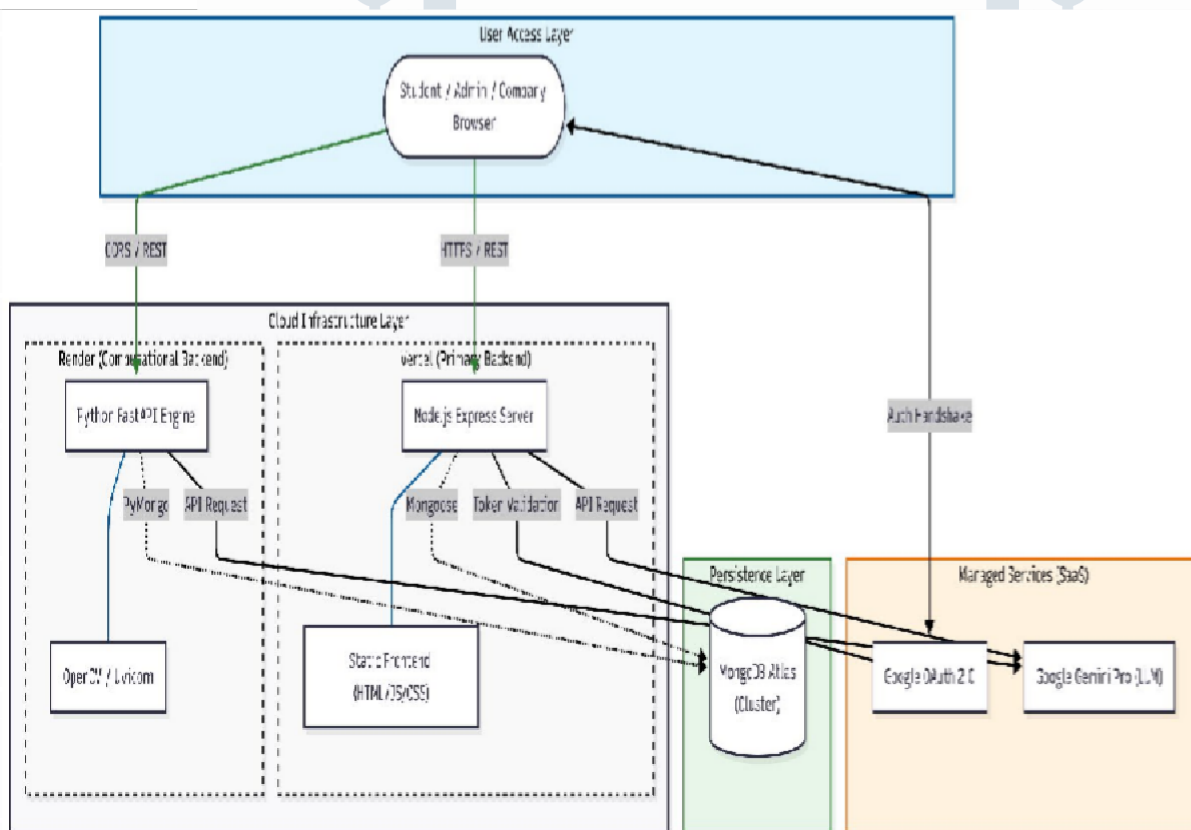


Fig. 6. System deployment architecture

- Figure 6 presents the deployed architecture of the *PrepWise AI* platform hosted using Vercel, Render, and MongoDB Atlas. The modular deployment structure separates backend services, AI processing, and microservices for improved scalability and maintainability.
- Experimental observations under concurrent user activity confirmed stable API response, reliable database connectivity, and smooth execution of AI-powered features. The system maintained responsive operation during coding assessments, mock interviews, and analytics generation.

G. Technology Stack and Resource Utilization

Component	Technology Used	Purpose
Frontend	HTML, CSS, JavaScript	User Interface
Backend	Node.js, Express	API and Server Logic
Database	MongoDB Atlas	Data Storage
AI Integration	Google Gemini API	Interview & ATS Analysis
Code Execution	Python FastAPI	Secure Program Execution
Proctoring	OpenCV	Face Detection
Deployment	Vercel & Render	Cloud Hosting

Table 1. Technology Stack and System Resources

- Table 1 summarizes the technologies used in the implementation of the *PrepWise AI* system. The integration of lightweight frontend technologies with cloud-based backend and AI services ensures efficient performance and scalability.
- The modular architecture reduces processing overhead by separating specialized services such as code execution and face detection into independent microservices. The obtained results demonstrate that the system is scalable, maintainable, and suitable for real-world placement preparation environments.

VIII. CONCLUSION

This research presents PrepWise AI, an AI-powered career readiness ecosystem designed to address the limitations of traditional placement preparation systems. By integrating multiple functionalities into a single platform, the system provides a structured, data-driven, and personalized approach to placement preparation.

The platform improves transparency, enhances student performance, and supports informed decision-making for recruiters and TPOs. Its ability to provide real-time insights and predictive analytics makes it a powerful tool for modern placement ecosystems.

The modular architecture allows future expansion, including the integration of advanced AI models, real-time communication tools, and external job portals. Overall, PrepWise AI has the potential to transform campus placement processes by making them more efficient, intelligent, scalable, and equitable.

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