AceIt: An AI-Powered Career Preparation Platform for Personalized Campus Placement Readiness

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***Abstract*—Campus placement preparation has become an increasingly complex and competitive process, requiring students to demonstrate proficiency across multiple dimensions, including technical problem-solving, quantitative and logical aptitude, communication skills, interview performance, and professional resume presentation. Existing preparation tools are largely fragmented, offering isolated solutions with limited personalization and insufficient feedback mechanisms. This paper presents AceIt, an AI-powered career preparation platform designed as a unified, intelligent, and adaptive system to support holistic campus placement readiness. The proposed platform integrates adaptive aptitude testing, multi-language coding challenges, AI-driven mock interviews, speech-based communication analysis, and automated resume evaluation within a scalable web-based architecture. Leveraging modern machine learning, natural language processing, and speech processing techniques, AceIt continuously analyzes user performance to generate personalized learning paths, targeted recommendations, and actionable feedback. By consolidating multiple preparation dimensions into a single intelligent platform, AceIt aims to bridge the gap between academic preparation and industry expectations, thereby improving student confidence, preparedness, and employability outcomes.**

***Index Terms*—Artificial Intelligence, Campus Placement, Adaptive Learning, Mock Interview, Resume Analysis, Natural Language Processing, Speech-to-Text.**

I. Introduction

The transition from academic education to professional employment represents a critical milestone in a student's career. Campus placement processes are no longer limited to evaluating theoretical knowledge but increasingly emphasize problem-solving ability, logical reasoning, communication effectiveness, adaptability, and professional presentation. Students are expected to perform well in written aptitude tests, technical coding rounds, group discussions, and multi-stage interviews, often under significant time pressure. Preparing for these diverse requirements using traditional methods is both time-consuming and inefficient. Most students rely on a collection of independent platforms such as coding practice websites, aptitude test portals, and interview preparation videos. While these resources provide partial support, they lack integration, personalized guidance, and holistic performance assessment.

The absence of continuous feedback and adaptive learning pathways prevents students from accurately identifying their strengths and weaknesses, leading to unfocused preparation strategies and increased anxiety during actual placement drives. Recent advancements in artificial intelligence have enabled intelligent learning systems capable of analyzing user behavior and adapting content accordingly. AI-driven platforms can provide personalized feedback, simulate realistic scenarios, and track performance trends over time. However, many existing systems focus on a single aspect of placement preparation, such as coding or interview simulation, without offering a unified solution.

To address this research gap, this paper proposes AceIt, an AI-powered career preparation platform that functions as a virtual placement coach. The platform integrates aptitude training, technical skill development, mock interviews, and resume analysis into a single system, supported by continuous analytics and adaptive recommendation mechanisms.

II. Related Work

Several studies have explored the use of artificial intelligence in placement preparation and interview assessment. AI-powered virtual interview simulators utilize natural language processing and speech analysis to evaluate candidate responses and provide feedback. Advanced mock interview systems integrate large language models to generate realistic interview questions and assess response quality. Multi-modal interview evaluation frameworks incorporate audio, visual, and textual cues to analyze soft skills such as confidence and communication effectiveness. Adaptive learning systems have also been proposed for aptitude training and career guidance, employing machine learning algorithms to personalize content based on user performance. Resume analysis tools leverage NLP techniques to extract skills, match job descriptions, and optimize resumes for applicant tracking systems. While

these approaches demonstrate the effectiveness of AI-driven personalization, most existing solutions address isolated components of placement preparation. AceIt differentiates itself by integrating these capabilities into a single platform. Unlike standalone systems, AceIt combines adaptive aptitude training, coding practice, interview simulation, communication analysis, and resume evaluation within a unified architecture. This holistic approach enables continuous performance monitoring and cross-module analytics, providing a comprehensive view of student readiness.

III. Problem Statement

Despite the widespread availability of online placement preparation resources, students continue to face significant challenges due to the fragmented nature of existing tools. Most platforms adopt a one-size-fits-all approach, providing static question banks and generic feedback irrespective of individual proficiency levels. Personalized guidance, realistic interview simulations, and structured communication skill evaluation are often missing or limited. Furthermore, students lack a centralized mechanism to track progress across different preparation domains. Performance in aptitude tests, coding exercises, and interviews is evaluated independently, making it difficult to derive a comprehensive understanding of overall readiness. This fragmentation results in inefficient preparation strategies, increased stress, and a mismatch between student capabilities and industry expectations. There is a clear need for an intelligent, adaptive, and unified placement preparation system that continuously analyzes student performance, identifies learning gaps, and provides targeted improvement strategies.

IV. Literature Review

Recent research has explored the use of artificial intelligence to support campus placement preparation through interview simulation, coding assistance, and career guidance systems. G. S. Rao et al. presented "AI Powered Virtual Job Interview Simulator Using Natural Language Processing" [1], which uses NLP to generate dynamic interview questions and evaluate responses based on content and tone. The system supports text and speech inputs with adaptive difficulty but focuses mainly on HR interviews and lacks integrated aptitude training, technical skill development, and long-term progress tracking.

P. K. Mishra et al. proposed "AI-Driven Virtual Mock Interview Development" [2], which employs large language models to simulate interviews and provide real-time feedback using a scalable cloud-based architecture. Similarly, R. Umbare et al. introduced "From Practice to Perfection: AI-Driven Mock Interviews for Career Success" [3], which incorporates facial emotion recognition, posture detection, and speech analysis to assess confidence and communication skills. While these systems improve interview preparedness, they are computationally intensive and do not integrate coding practice, aptitude training, or resume evaluation within a single platform.

In the area of technical skill development, Y. Li et al. proposed "Enhancing LLM-Based Coding Tools through Native Integration of IDE-Derived Static Context" [4] to improve code completion accuracy and reduce hallucinations, while M. Mentari et al. presented "A Study of Code Typing Problems as Start-Up Programming Practices in Java Programming Learning Assistant System" [5] to support beginner coding practice with automated feedback. Although effective for programming proficiency, these methods do not evaluate aptitude, communication skills, or interview readiness.

For personalized career preparation, P. D. Devi et al. presented "AI-Enhanced Career Guidance and Aptitude Testing for Higher Education" [6], and S. Patel et al. proposed "A RAG-based Personal Placement Assistant System using Large Language Models for Customized Interview Preparation" [7]. Despite providing personalization, these systems operate as standalone tools and do not offer a unified framework that integrates aptitude training, coding practice, communication assessment, resume analysis, and continuous performance analytics.

Overall, existing studies address individual components of placement preparation such as interviews, coding, or career guidance. A clear research gap exists for a unified AI-powered placement preparation ecosystem integrating technical skills, aptitude training, communication evaluation, resume analysis, and adaptive feedback, motivating the proposed AceIt platform as a comprehensive virtual placement coach.

V. Proposed System Architecture

A. Overall System Architecture

The AceIt platform follows a modular, service-oriented architecture consisting of a web-based frontend, an API-driven backend, and multiple AI-powered processing services, as illustrated in Fig. 1. The system is designed to support scalable user interaction, real-time evaluation, and personalized feedback across aptitude practice, coding challenges, mock interviews, video presence analysis, and resume evaluation. The frontend communicates with backend services through RESTful APIs secured with JWT-based authentication. AI services are invoked asynchronously for computationally intensive tasks such as speech processing, large language model inference, computer vision analysis, and document parsing.

The system integrates cloud-based LLM APIs (Google Gemini, OpenAI/Groq) for conversational intelligence, Piston for secure code execution, and MediaPipe/OpenCV for real-time video presence analysis. Performance data from all modules is aggregated and visualized through a centralized analytics dashboard, enabling continuous monitoring and adaptive recommendations.

B. Frontend Architecture

The frontend of AceIt is implemented using React (with Vite) and follows a component-based design to ensure modularity, reusability, and maintainability. Tailwind CSS enables responsive UI design, while React Router DOM supports seamless navigation between modules. Global state, including authentication status and user context, is managed using the

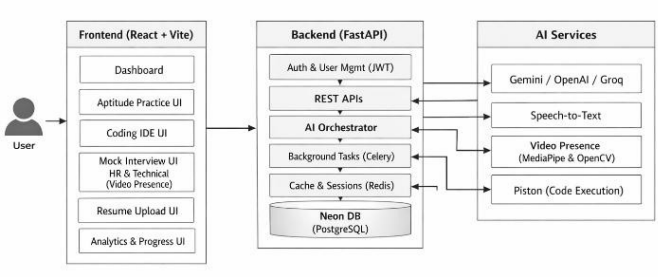

Fig. 1. System Architecture

Context API and custom hooks. The frontend integrates specialized libraries such as Recharts for analytics visualization, MediaPipe Tasks Vision for browser-based computer vision, and jsPDF for client-side report generation. Interactive components include dashboards, adaptive aptitude interfaces, multi-language in-browser IDEs, interview simulation interfaces, and resume upload modules.

C. Backend Architecture

The backend is implemented using FastAPI to support asynchronous request handling and high-throughput APIs. PostgreSQL (Neon DB) is used as the primary persistent datastore for user profiles, question banks, test cases, and analytics, while SQLAlchemy serves as the ORM layer. Authentication is stateless and secure using JWT tokens. External AI services including Gemini and Groq/OpenAI are orchestrated through dedicated service layers to isolate AI logic from core application logic. Code execution is managed via sanitized subprocesses/execution engines to provide real-time feedback.

VI. Core Modules

The AceIt platform is composed of multiple functional modules, each designed to address a specific aspect of placement preparation, including aptitude practice, coding challenges, mock interviews with video presence analysis, resume evaluation, and performance analytics. These modules operate in an integrated manner to provide continuous assessment and personalized feedback across technical, aptitude, and communication dimensions. A concise summary of the functional scope and key outputs of each module is presented in Table I.

TABLE I
Core Modules of the AceIt Platform

Module	Purpose	Key Output
Adaptive Aptitude	Adaptive aptitude practice	Accuracy, weak topics
Coding Challenges	Technical interview coding	Test results, code feedback
Mock Interview (HR, Technical & Video Presence)	Interview & presence evaluation	Confidence score, feedback
Resume Analyzer	Resume quality & ATS fit	ATS score, improvement tips
Analytics Dashboard	Progress tracking & guidance	Charts, focus plan

A. Adaptive Aptitude Module

The aptitude module supports quantitative, logical, and verbal reasoning. Questions are stored in Neon DB and retrieved randomly based on the selected topic using a round-robin shuffling strategy to ensure balanced exposure. An adaptive difficulty algorithm adjusts question complexity based on user accuracy, response time, and historical performance. An AI chatbot (OpenAI API) is integrated to resolve doubts and provide conceptual explanations.

B. Coding Challenges Module

The coding module provides a browser-based integrated development environment (IDE) supporting multiple programming languages, including R, C, C++, Python, and Java. Code compilation and execution are handled using the Piston API. Questions with predefined test cases and starter code are stored in Neon DB. The module simulates technical interview coding rounds by evaluating correctness, efficiency, and adherence to best practices. An AI assistant supports debugging, conceptual guidance, and optimization suggestions. Performance trends are recorded to recommend appropriate problem sets and learning resources.

C. Mock Interview Module (HR, Technical & Video Presence Analysis)

The mock interview module simulates real-world HR and technical interviews using AI-driven conversational agents. The HR interview focuses on behavioral and situational questions, while the technical interview includes real-time adaptive questioning across multiple categories such as Python, Java, SQL, and system fundamentals. The conversational flow is powered by the Gemini large language model, enabling context-aware follow-up questions.

In addition to verbal interaction, the module integrates video presence analysis to evaluate non-verbal communication cues during interview sessions. Camera input is processed using MediaPipe and OpenCV to track eye contact, head movements, and facial expressions. Audio hesitation patterns are analyzed in parallel. These multi-modal signals are fused to compute a qualitative confidence score and engagement metrics. Structured feedback is generated by combining linguistic analysis of responses with non-verbal behavior assessment, providing actionable recommendations to improve both verbal and visual interview performance.

D. Resume Analyzer Module

The resume analyzer processes uploaded documents using NLP-based pipelines to extract structured information. Resumes are evaluated for keyword relevance, formatting quality, and ATS compatibility by benchmarking against industry standards. The system generates actionable suggestions and downloadable reports to enhance resume effectiveness and professional presentation.

VII. Result

To evaluate the effectiveness of the proposed AceIt platform, the system was tested using representative datasets and controlled usage scenarios that simulate campus placement preparation workflows. The platform was exercised across all core modules, including aptitude practice, coding challenges, mock interviews with video presence analysis, and resume evaluation. Performance logs and analytics generated by the system over multiple sessions were analyzed to assess learning progression patterns, system responsiveness, and platform engagement behavior.

A. Module-Wise Performance Evaluation

1) Adaptive Aptitude Module: The aptitude module records accuracy, response time, and difficulty progression for each practice session. The round-robin question shuffling mechanism ensured balanced topic coverage, while the adaptive difficulty engine progressively adjusted question complexity based on performance history. As illustrated in Fig. 2, the difficulty level is increased from easy to medium and hard once threshold accuracy is achieved. System logs indicate an upward trend in accuracy metrics across repeated practice cycles, particularly in quantitative and logical reasoning categories. The adaptive selection mechanism effectively prioritized weaker topics by increasing their sampling frequency in subsequent sessions.

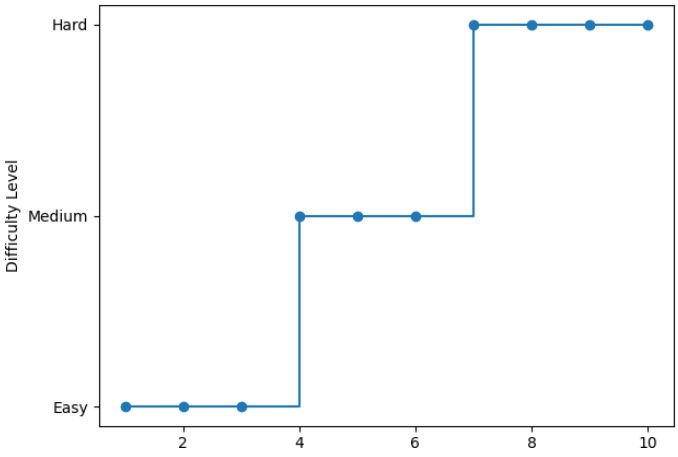

Fig. 2. Adaptive difficulty progression in the aptitude module based on threshold performance.

2) Coding Challenges Module: The coding module evaluates code submissions using predefined test cases and execution metrics. Integration with the Piston execution environment enabled near real-time compilation and result feedback. Logged metrics indicate a reduction in failed test cases and execution errors across iterative attempts, along with improved time-to-solution trends. The integrated AI assistant contributed to faster error resolution and incremental improvements in code quality across repeated evaluations.

3) Mock Interview Module with Video Presence Analysis: The mock interview module generates relevance, clarity, and confidence scores based on combined linguistic analysis and video presence features. Aggregated session metrics indicate progressive improvements in response coherence and reduced hesitation indicators across repeated interview simulations. Video presence analysis logs reflect stabilization of eye contact metrics and head pose consistency over successive sessions, resulting in increased confidence scores computed by the multi-modal fusion pipeline.

4) Resume Analyzer Module: The resume analyzer evaluates ATS compatibility, keyword relevance, and structural formatting based on industry benchmarks. System-generated recommendations led to improved alignment scores in subsequent resume evaluations. Comparative analysis of pre- and post-revision scores indicates enhanced keyword coverage and structural consistency, improving readiness for automated resume screening pipelines.

B. System Performance and Responsiveness

System responsiveness was evaluated using average API latency, AI inference time, frontend rendering latency, and database access latency. FastAPI enabled low-latency handling of standard interactions, while computationally intensive tasks such as LLM inference, speech-to-text processing, and video presence analysis were handled asynchronously using background workers.

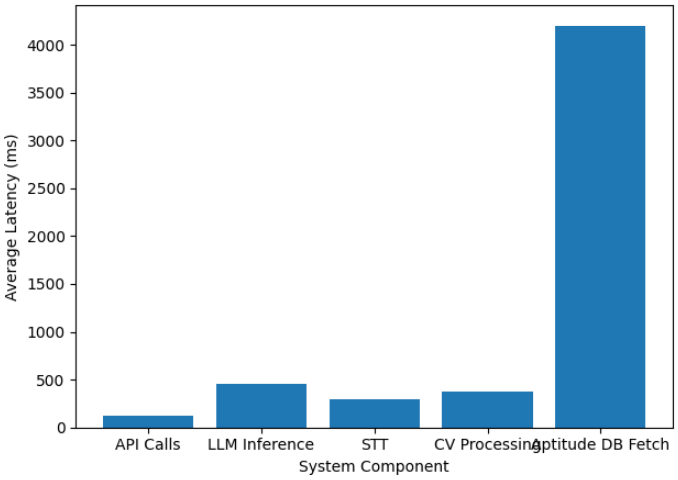

Fig. 3. Average response time of core system components

As illustrated in Fig. 3, aptitude question retrieval from the database exhibits the highest average latency due to random sampling over large topic pools and remote database access. This indicates the need for caching, query indexing, and prefetching to improve response times.

Overall, interview feedback generation latency remained within acceptable bounds for near real-time interaction, demonstrating the suitability of the proposed architecture for interactive learning scenarios.

C. Platform Engagement and Learning Impact

Platform engagement was analyzed using session frequency, module access distribution, and completion rates of practice

sessions recorded by the analytics dashboard. The centralized dashboard and performance visualization features enabled consistent tracking of progress across aptitude, coding, interview, and resume modules. The unified workflow reduced context switching between independent preparation tools and supported continuous performance monitoring within a single interface, facilitating structured preparation workflows.

D. Comparative Analysis with Traditional Preparation Workflows

Compared to traditional preparation workflows that rely on independent platforms for coding practice, aptitude testing, and interview preparation, AceIt provides a unified environment with continuous analytics and adaptive feedback mechanisms. The integrated architecture enables consistent performance tracking, cross-module analytics, and personalized recommendation flows that are not feasible in fragmented preparation ecosystems. This holistic integration supports more structured preparation strategies and provides systematic feedback across technical, aptitude, and communication dimensions.

VIII. Conclusion

This paper presented an AI-powered placement preparation platform designed to bridge the gap between academic learning and industry expectations by providing a unified, intelligent preparation environment. Unlike fragmented preparation workflows that rely on multiple independent tools, AceIt integrates aptitude training, coding challenges, AI-driven mock interviews with video presence analysis, resume evaluation, and centralized analytics within a single modular system.

The proposed system architecture, built using a modern web stack and AI service orchestration, enables scalable, low-latency interactions while supporting multi-modal data processing, including text, audio, and video inputs. The performance and analytics dashboard serves as a key outcome of the system, transforming raw performance metrics into actionable insights through quantitative indicators, qualitative AI guidance, and personalized focus plans.

Experimental evaluation based on system logs and controlled usage scenarios demonstrates that the platform effectively supports continuous performance tracking, adaptive learning pathways, and real-time feedback across multiple preparation dimensions. The integration of large language models, automated code execution, and computer vision-based presence analysis enables more realistic interview simulations and holistic skill assessment. Overall, AceIt provides a practical and extensible foundation for AI-driven career preparation systems, with strong potential to enhance structured placement readiness in academic environments.

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