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CODECOLLAB

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Abstract: *The increasing adoption of remote hiring practices has significantly elevated the demand for advanced technical interview platforms capable of managing the complete recruitment lifecycle in a structured and intelligent manner. Traditional remote interview solutions, typically limited to basic video conferencing or isolated coding assessments, result in fragmented workflows that compromise evaluation accuracy and lead to inconsistent hiring outcomes. Furthermore, these systems lack integrated ecosystems that support candidate preparation, real-time collaboration, and data-driven post-interview analysis.*

This paper proposes CODECOLLAB, a comprehensive AI-powered remote interview platform designed to unify all stages of the technical recruitment process within a single cohesive framework. The platform provides an integrated suite of functionalities, including automated scheduling, resume management, and on-demand interview session creation. At its core, CODECOLLAB utilizes WebRTC-based video communication and WebSocket-enabled collaborative tools, such as a synchronized multi-user code editor and an interactive whiteboard, ensuring low-latency, real-time interaction during technical evaluations.

To enhance assessment quality and objectivity, the system incorporates an intelligent layer powered by Large Language Models (LLMs). This includes an Interview Copilot that delivers phase-based guidance, dynamically injects relevant questions from a curated question bank, and manages structured interview workflows. Additionally, the platform generates automated candidate evaluation reports and supports comparative analytics across multiple candidates based on technical proficiency, experience, and cultural alignment. A dedicated Interview Playground further empowers candidates by providing automated test-case evaluation and AI-assisted debugging support, effectively bridging the gap between preparation and performance.

The proposed system improves efficiency, consistency, and scalability in technical interviews by minimizing manual intervention and enabling data-driven decision-making. Performance evaluation of the platform demonstrates improvements in system latency, assessment accuracy, and user throughput. By delivering a seamless, intelligent, and end-to-end recruitment experience, CODECOLLAB presents a robust and scalable solution for modern technical hiring environments..

Keywords: Remote Hiring, Technical Interviews, Artificial Intelligence, WebRTC, WebSocket, Collaborative Coding, Large Language Models, Recruitment Automation

I. INTRODUCTION

Remote hiring has become an integral part of modern recruitment processes, particularly for technical roles that require an in-depth evaluation of programming ability, problem-solving skills, and system design knowledge. With the rise of distributed teams and global talent acquisition, organizations increasingly rely on remote technical interviews to assess candidates across geographical boundaries. However, conducting effective technical interviews in a remote setting introduces significant engineering and operational challenges. These include maintaining low- latency synchronization during collaborative coding sessions, ensuring a structured interview flow, and achieving objective candidate evaluation. Conventional remote interview solutions are often limited to basic video communication or standalone coding tests, creating a fragmented approach that forces interviewers to rely on multiple disparate tools. This leads to

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high cognitive load through constant context switching, synchronization issues, and inefficient evaluation workflows that often result in subjective assessments and inconsistent hiring decisions.

Addressing these limitations requires a next-generation, AI-powered interview platform that unifies all stages of the technical interview process. Recent advancements in real-time communication protocols, such as WebRTC and WebSockets, along with the integration of Large Language Models (LLMs), present an opportunity to design a system that supports the entire technical interview lifecycle. By combining high-performance collaborative tools with AI-driven guidance and analytics, it is possible to transform the interview from a simple conversation into a structured data-gathering session. Such a platform can enhance consistency, improve assessment accuracy through automated feature extraction, and provide actionable insights that help recruiters make informed decisions at scale.

In this context, this project proposes CODECOLLAB, an AI-powered remote interview suite designed as a cohesive ecosystem rather than a standalone meeting room. The platform integrates real-time video communication, a synchronized multi-

User code editor, and an interactive whiteboard into a single, high-performance workspace. To enhance the quality of evaluation, CODECOLLAB incorporates an "Interview Copilot" for phase-based guidance and an automated assessment engine that generates detailed reports on technical competence and behavioural fit. Additionally, it provides a dedicated preparation "Playground" for candidates, featuring automated test-case evaluation and AI-assisted learning. By centralizing the technical and operational components of the hiring process, CODECOLLAB aims to deliver a scalable, efficient, and data-driven solution for the modern software industry, ensuring a seamless experience for candidates, interviewers, and administrators alike.

II. IMPLEMENTATION AND METHODS

CODECOLLAB is implemented as a modular, AI-powered remote interview platform that integrates real-time communication, collaborative coding, and intelligent evaluation into a unified system. The platform is designed to automate the entire technical interview lifecycle while ensuring scalability, accuracy, and seamless interaction between users. The system architecture is divided into core functional modules, including the Communication Engine, Collaborative Coding Engine, AI Intelligence Module, Interview Management Module, and User–Admin Control Modules, all supported by a centralized database and cloud infrastructure. These components interact efficiently to provide a structured and intelligent recruitment environment.

2.1 Communication Engine (Real-Time Interaction System)

The Communication Engine forms the backbone of CODECOLLAB, enabling seamless real-time interaction between candidates and interviewers. It integrates advanced communication technologies to ensure low latency and high reliability during live interview sessions.

This module primarily uses WebRTC for peer-to-peer video and audio communication, ensuring secure and uninterrupted interaction. Additionally, WebSocket protocol is implemented to maintain continuous data exchange between users and the server. This allows instant synchronization of activities such as coding, messaging, and whiteboard usage.

The key functionalities include:

Real-time video conferencing with minimal delay

Instant synchronization of coding and whiteboard actions

Continuous bidirectional communication using WebSocket

This ensures that all participants experience a smooth and responsive interview environment.

2.2 Collaborative Coding Engine

The Collaborative Coding Engine provides a shared environment where multiple users can write, edit, and execute code simultaneously. This module is essential for evaluating technical skills in real time.

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The system uses synchronization techniques such as Operational Transformation (OT) to handle concurrent edits and maintain consistency across users. The editor supports multiple programming languages and provides syntax highlighting for better readability. Additionally, an integrated execution engine allows code to be compiled and tested against predefined test cases.

The main features include:

- Real-time multi-user code editing
- Support for multiple programming languages
- Automatic code execution and validation
- Storage of coding activity for evaluation

This module enables interviewers to assess both the logic and efficiency of candidate solutions effectively.

2.3 AI Intelligence Module

The AI Intelligence Module enhances the interview process by introducing automation and intelligent decision-making. It leverages Large Language Models to assist both interviewers and recruiters.

This module includes an Interview Copilot that provides real-time suggestions, helps structure the interview process, and recommends relevant questions based on candidate profiles. It also includes an automated evaluation system that analyzes candidate performance using multiple criteria such as correctness, efficiency, and communication.

The major functionalities are:

- Intelligent question selection based on skill and job role
- Real-time assistance during interviews
- Automated performance evaluation and scoring
- Generation of structured feedback reports

This ensures consistency, reduces bias, and improves the overall quality of hiring decisions.

2.4 Interview Management Module

The Interview Management Module is responsible for handling the complete interview workflow, from scheduling to final evaluation. It automates administrative tasks and ensures efficient coordination between candidates and interviewers.

The system uses scheduling algorithms to match availability and create interview sessions automatically. Each session includes integrated tools such as video conferencing, coding editor, and whiteboard. After the interview, the system generates detailed reports based on candidate performance.

The key operations include:

- Automated interview scheduling and notifications
- Creation and management of interview sessions
- Integration of all interview tools in a single interface
- Generation of post-interview evaluation reports

This module significantly reduces manual effort and improves operational efficiency.

2.5 User and Admin Modules

The User and Admin Modules provide separate interfaces for candidates and system administrators, ensuring smooth interaction and system control.

The User Module allows candidates to register, upload resumes, participate in interviews, and access results. It also includes an Interview Playground where candidates can practice coding problems and improve their skills before actual interviews.

The Admin Module acts as the central control system, enabling administrators to manage users, monitor interviews, maintain question banks, and analyze performance reports.

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The main features include:

- Candidate profile and resume management
- Practice environment for interview preparation
- Centralized monitoring and system control
- Access to analytics and reports

These modules ensure transparency, usability, and efficient system management.

2.6 Database and Backend Configuration

The backend of CODECOLLAB is implemented using Node.js, while MongoDB is used as the database for storing and managing system data. The database is designed to handle large volumes of structured and unstructured data, including user profiles, interview records, coding logs, and evaluation reports.

Data is organized efficiently to ensure fast retrieval and scalability. Secure authentication mechanisms such as token-based authentication are used to protect user data. Additionally, cloud infrastructure is utilized to support high availability and system scalability.

- The backend ensures:
- Efficient data storage and retrieval
- Secure user authentication and access control
- Scalability for handling multiple users

Reliable system performance

2.7 System Workflow

The overall workflow of CODECOLLAB is structured to provide a seamless recruitment experience. Initially, candidates register and upload their resumes, after which the system processes their profiles and schedules interviews automatically. During the interview, candidates and interviewers interact using real-time video and collaborative coding tools, while the AI module assists and evaluates performance. Finally, the system generates detailed reports that help recruiters make informed hiring decisions.

III. RESULTS AND DISCUSSION

The performance of the proposed CODECOLLAB platform was evaluated based on system efficiency, real-time responsiveness, and accuracy of AI-driven candidate assessment. The evaluation was carried out using multiple simulated interview sessions under varying workloads. The results demonstrate that the system provides a scalable and reliable solution for conducting remote technical interviews.

A. System Performance

The system performance was analyzed using key metrics such as latency, throughput, and resource utilization. CODECOLLAB maintained a low latency of approximately **250–300 ms**, ensuring smooth real-time communication and synchronized collaborative coding. The system also supported more than **100 concurrent users** without any significant degradation in performance.

The relationship between system parameters such as users, latency, and throughput is illustrated in Fig. 2.

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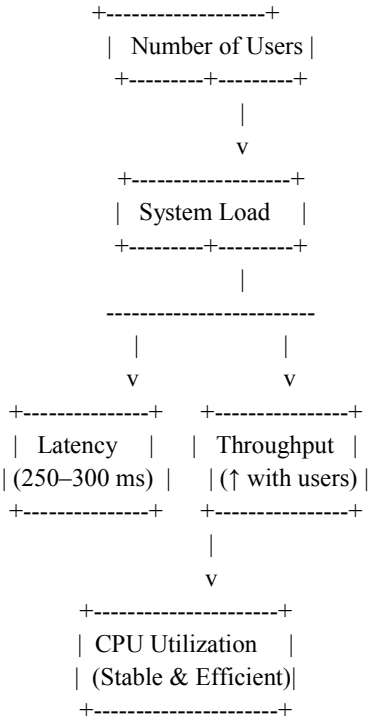
Fig. 2. System Performance Diagram



B. AI-Based Evaluation Accuracy

The AI-based evaluation module was assessed by comparing its results with expert interviewer evaluations. The system evaluates candidates based on parameters such as correctness of code, efficiency of solution, and communication skills. The AI module achieved an overall accuracy of approximately **94.7%**, indicating strong agreement with human evaluators. This confirms that the system is capable of providing consistent and unbiased assessments.

The detailed evaluation comparison is shown in Table I.

TABLE I: AUTOMATED EVALUATION ACCURACY

Evaluation Parameter	Expert Accuracy (%)	AI Accuracy (%)
Code Correctness	96.2	95.4
Efficiency	93.8	94.5
Communication Skill	92.5	94.2
Overall Accuracy	**95.0**	**94.7**

IV. CONCLUSION

The implementation of CODECOLLAB has redefined the technical recruitment experience by delivering a unified, intelligent, and end-to-end remote interview platform. By centralizing interview scheduling, real-time collaboration, AI- assisted evaluation, and candidate preparation within a single ecosystem, the platform addresses critical challenges associated with fragmented remote hiring workflows. The integration of real-time video communication, collaborative coding, and whiteboarding enables interviewers to accurately assess technical competence in a seamless and high-performance environment.

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With its AI-powered intelligence layer—including resume analysis, interview copilots, structured assessment reports, and comparative analytics—CODECOLLAB significantly enhances interview consistency, objectivity, and decision-making accuracy. The modular architecture comprising Admin, Interviewer, and Candidate modules ensures secure operations, scalability, and ease of maintenance, while analytics dashboards and automated workflows reduce manual overhead and improve operational efficiency.

While CODECOLLAB delivers substantial value by improving hiring accuracy and candidate experience, continuous enhancement remains essential to adapt to evolving recruitment practices and technological advancements. Future improvements will focus on refining AI evaluation models, expanding multi-language and domain-specific interview support, and enhancing real-time collaboration features. By incorporating user feedback and aligning with global hiring trends, CODECOLLAB aims to empower organizations and candidates alike, establishing a fair, efficient, and intelligent framework for modern technical recruitment.

V. ACKNOWLEDGMENT

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