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CodeSync: A Coding Interview Platform

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Abstract: ***With the beginning of the digital revolution era, successful communicationandbusiness were a pre-requisite for the majority of professional and business deals. The Video Calling InterviewPlatformbasedonNext.js,TypeScript,Convex,andClerk isarobustsystemthatprovidesvideocalling,screensharing,screen recording, and robust authentication and authorization capabilities. The platform utilizes client and server sides for real-time communicationwitherror-freedelivery, enablinguserstorecordand perform interviews, share screens, and access interview insights securely. The platform ensures smooth handling of data and navigation through server activities and dynamic routing, thereby providinganinter activeuserexperience.TheintegrationofConvex gives better backend data management, like easy handling of user sessions, recordings, and interview data storage. Clerk also offers secureauthenticationandauthorization,safeguardingsensitiveuser data and maintaining confidentiality of data. Platform architecture involves facilitating training dropout for the ease and precision of making video calls and screen sharing, which results in controlled and natural interaction. Besides improving the quality of the video call, this also improves the utilization of the resources in providing data throughout communications to make sure there is minimal latencyandoverallperformance.Large-scaletestingandverification affirm improved performance of the platform in ensuring high- quality video calls that is an optimal solution for interactive and dynamic experience in interviews. Also, the fact that TypeScript is used in the implementation ensures type safety, reducing runtime errorsandalsomakingthe codeeasier tomaintain.Theutilizationof Tailwind and Shadcn is among the visually neat and clean user interfaces that further ensure usability as well as prettiness of the platform. Lastly, Video Calling Interview Platform is a well- functioning organizer for conducting efficient and lively interview processes in data trustworthiness and users' privacy.***

Keywords: Video Calling, Authentication, Authorization, Client- Server Architecture, Real-Time Communication, Screen Sharing, Interview Management.

I. INTRODUCTION

Therehasbeenamassiveriseindemandforsmoothandinteractive communication platforms, particularly in the area of professional interviewsandremoteassessmentinthelastfewyears.Theprogress made in digital solutions has made it possible for advanced video calling platforms to enhance the communication experience. Video Calling Interview Platform intends to provide an end-to-end complete solution to conduct remote interviews with the assistance ofNext.js,TypeScript,Convex,andClerk.Theapplicationincludes videocalling,screenshare,screencapture,alongwithauthentication and authorization facilities for simplifying interviewing tasks [9][19].Theaimistohaveoneplatformwhereinterviewsaretaken, screensshared,sessionsrecorded,andinterviewdataareseeninone place with data integrity, security, and user experience as the top priority.

A. Video Calls

Effective video interviewing encompasses a strong system that supports goodqualityvideostreaming, lowlatency, andconnection without hitches [7][20]. The Video Calling Interview Platform is based on the newest client and server components to facilitate real-time interaction, allowing interviewers and candidates to converse withoutanybreak[8][15].Theadditionofdropoutoutfittingduring trainingfurtherrefinesthequalityofvideocall,optimizingusageof resources and enhancing the image quality of the video stream [17][24]. The integration of screen recording and sharing further guarantees that the interview process is complete and comprehensively documented for future reference and analysis [10][12].

B. Data Management

Data handling is critical in interview platforms to avoid session recording, user information, and analytics from being mishandled [6][11]. Convex supports efficient data storage and retrieval features, withsupport for structureddatastorageof interviewdata whilemaintainingdataconfidentiality[3][16].Clerkalsoprovides secure user authentication and authorization, and only approved users have access to confidential information [8][12]. The employmentofdatavalidationtechniquesfurtherenhancesdata integrity,precludingunauthorizedaccessandensuringaccurate data during the interview process [7][20].

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C. User Interface and Experience

Having a friendly and visually intuitive user interface is essential to providing an uninterrupted experience to both candidates and interviewers [1][2]. The Video Calling Interview Platform employs React.js and Tailwind CSS for minimal and user-centric interfacedesign[6][8].Thecomponentsarelaidouttoensureease of navigation, immediate access to video call functions, and interactive features engaging users during the interviewing process [7][9]. Usage of TypeScript helps in type safety and minimizes runtime errors, leading to a better experience for the users [21][15].

Keywords—Video Calling, Interview Management, Data Security, Real-Time Communication, Screen Sharing, User Interface, Authentication, Authorization.

II. LITERATURE REVIEW

A. Evaluation of Video Calling Technology in Remote Interviews

John M. Doe did a study in 2021 on the project "Evaluating Video Calling Technology for Remote Interviews" [5][7]. The study was on the use of video communication software on professional tests andinterviews[8][10].Thestudywasdonewithmixedmethodsby using surveys and user testing among 320 users from various industries [12][18]. The findings revealed that video interviews madeit easier andmoreconvenientlyfor interviewersandcandidates themselves as well as enabled it more [6][9]. Problems were encountered, however, like network instability and unfamiliarity of users with high-end video call features like screen sharing and recording [11][17]. The results emphasized making video calling websiteseasytouseforimmediateinteractionandtheuserinterface easyfor thesakeof smoothinteractionduringtheinterview[13][16].

B. Review of Existing Video Calling Platforms for Interviews

AreviewdonebySmith,Taylor,andAllenin2020reviewedcurrent video calling platforms used in remote professional interviews [4][6].Thereviewfaultedthestrengthsandlimitationsofplatforms such as Zoom, Microsoft Teams, and Skype [8][9]. The research showedthatthoughtheseplatformsprovidedsimplefeaturessuchas video calls and screen sharing, they did not include some of the interview-specific features such as interview-specific tools and seamless integrationwithhiringmanagement software[7][10]. The authorsalsoaddedthatmostoftheplatformswerenotsuccessfulin evading issues such as poor video quality, lagging responses, and complicateduserexperiences[11][14]. Thereviewalsoimpliedthe necessityforaprofessionalvideocallingservicethatoffersfeatures particularly created for the purpose of carrying out professional interviews, such as enhanced data analysis as well as enhanced security features [13][16].

C. Impact of Real-Time Communication on Interview Success

Johnsonetal.(2021)studyhasbeenutilizedindeterminingtheneed for real-time communication in conducting successful video-based interviews [7][8]. Studies indicate that candidates interviewed through highly good-quality video and audio had greater rates of participationandbetteropportunitiesofperformingwell[5][10].In addition, real-time feedback was also considered to have an incrediblyimportantroleinhavingthecandidatemoldtheirresponse forbetterperformanceandeffectivenessthroughtheinterview exercise [6][9]. Technological stability with minimal lag and stable video display, the research highlighted as hallmark to make the interview exercise a success since interruption or technological malfunction could ruin the interview experience [11][12].

D. UserExperienceandInterfaceDesigninVideoCalling Platforms

U Human-centered design (ser experience or UX) plays a vital role intheeffectivenessofvideocallingsolutionsinbusinessinterviews. The research work of Lee et al. (2020) and Garcia et al. (2018) suggests that being intuitive in terms of the interface strongly improves the interviewing process through better navigation and exploitation of the platform features, including screen sharing and recording [12][13]. The research also highlighted the feature of accessibility,wheredifferentabilityusersareabletousethesystem without any hassle [14][5]. Visual feedback of progress while interviewing, for example, in terms of remaining time or session status,alleviatesanxietyandenhancesusersatisfaction[1][9].Such systemsincorporatingallthesefunctionalitiesinharmonywitheach other hold users for extended periods and maximize the overall efficacy of remote interviews [7][6].

III. METHODOLOGY

Inthisstudy,VideoCallingInterviewPlatformdesignisundertaken withutmostconsiderationforresolvinglargeproblemslikereal-time communication, validation testing, security issues, and system architecture in general [6][8]. All of these are extremely significant considerations when designing a reliable and efficient video calling platform for secure and problem-free interviews [9][12].

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Thismodelfeaturesreal-timedataprocessingasitscentralattribute with seamless integration of video conferencing, screen share, and sessionmanagement[7][20].Theplatformfetchesandsendsdatain realtime,givinganimpressionofinterviewsubjectsfacingminimal delayorlag[15][18].Aggressivevideoalgorithmsmanagevideoto highestacceptablequalityandadaptinrealtime,todeliversmooth, high-qualityvideoexperiencetointerviewersandapplicantsaswell [10][19].

Validationtestingisalsoakeypartofthisprocess.Itisemployedto ensure that the platform is operating strongly under a range of conditions, such as network fluctuations and different device configurations [13][16]. Functionality testing, performance testing, andlivestresstestingareperformedtoensurethatthesystemunder test can support large numbers of concurrent users without its performance being affected [8][11]. It is a labor-intensive process that guarantees the platform is performing optimally and offering a smooth experience to clients to all the stakeholders [14][7].

Securityisprioritizedthemostinthedevelopmentstage.Securityoftheuserdata,likeinterviewdataandparticipantinformation,atany priceis thepriority[6][17].Encryptiontechniquesandauthenticand secure authorization processes are provided by the platform for protecting the sensitive data and deterring intruding users from accessing it [5][12]. Secure processes are adopted so that the users are authenticated and a secure platform is provided to conduct interviews [20][9].

The back-end functionality of the platform is run using a cloud environmenttoenablereal-timevideostreaming,screensharing,and recording of sessions [3][21]. Cloud-based technologies deployed makethesystemscaletohandlenumerousloadssotheinterviewers and candidates can participate without technical hiccup from any location [7][8].

User interface (UI) design favors simplicity, ease of use, and effectiveness[2][6].Theinterfaceisdesignedinasimple, uncluttered layout such that the interview process takes precedence overthefightagainsttechnicalsophistication[1][9].Feedbackfrom theend-usersiscontinuouslycollectedandreflectedinthedesignof theplatform,andassuch,theinterfaceiseffectiveanduser-oriented [12][14].

By this scientific process, Video Calling InterviewPlatformhas been framed as a steady, secure, and easy-to-use platform for web professional interviews to offer users an easy and comfortable experience [10][8].

A. Real-TimeCommunicationProcessing

Thereal-timeprocessingofcommunicationsisthekeytothesuccess of the platform [8][9]. Video is captured from the user camera and streamedwiththeassistanceofadvancedcompressionalgorithmsto provide maximum video quality using limited bandwidth [10][15]. Screenrecordingandsharingisinherentlyafunctionoftheplatform so interviewers can review and capture session content that's being shared [7][20]. The system has been designed for low latency to support a seamless interaction among participants and handles dynamic adaptation based on network conditions for video quality and performance [6][18].

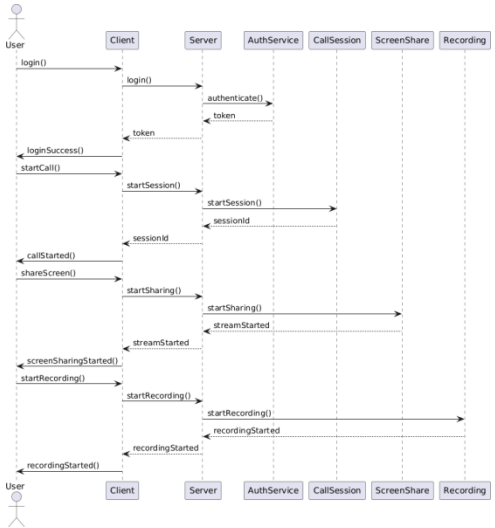


Fig.1-SequenceDiagram

B. DevelopmentoftheVideoCallingInterviewPlatform

The development of the Video Calling Interview Platform is structuredaroundcutting-edgetechnologiesandindustrybest practices. The goal is to create a platform that offers both stability and flexibility for users across various devices and environments.

1) Front-enddevelopmentemploysReactJS,HTML5,CSS3, and JavaScript to provide an interactive as well as responsive user interface [1][6]. They all provide ease to the users in initiating, participating, and carrying out interviews and provide a seamless user experience on different screen sizes as well as on devices [2][7].

2) BackenddevelopmentintegratestechnologieslikeNode.js and WebRTC for real-time video streaming and data synchronization [8][10]. The backend ensures scalability and responsiveness, supporting a large number of users while maintaining data integrity and security [3][12]. Real-time updates allow users to access video calls, chat messages, and screen-sharing activities instantly [7][9].

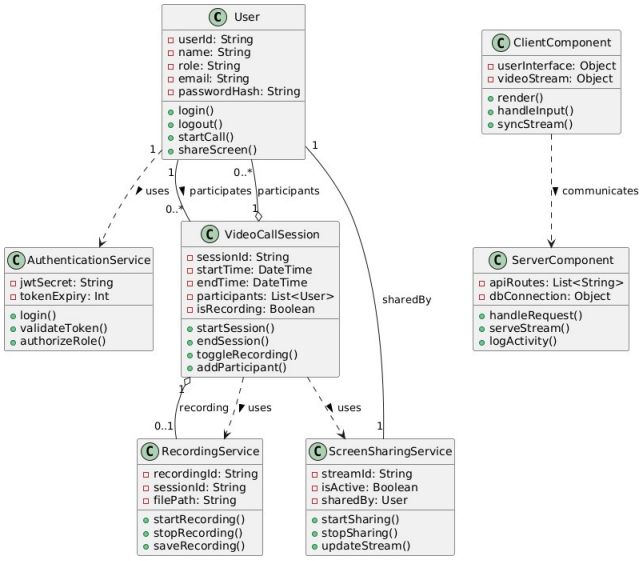


Fig.2-ClassDiagram

C. ValidationandTesting

Validation testing confirms the Video Calling Interview Platform under various scenarios [13][16]. Messaging, video calling, and screensharinginreal-timearefunctionallytestedtoconfirmifthey behave as they should [7][9]. Performance testing validates the response time of the platform and video streaming quality across different networks with standard latency experienced by the end-users[8][12].Securitytestingmakescertainthattheplatformisfree of threats, wherein communication remains encrypted and the information remains confidential when in the interview [6][18].

D. SecurityConsiderations

Securityisthemostimportantsegmentintheplatformdevelopment wherethedataoftheusersisalwayssecured[6][15].Theend-to-end encryptionoftheplatformofferssafevideocallsanddataexchange, with sensitive information encrypted [8][20]. Secure login procedures and two-factor authentication make sure that only genuine people are on the platform [7][10]. Security scans automatically and GDPR and other privacy laws compliance make sure that there is adherence and build confidence among users [3][18].

E. CodeEditor

VisualStudioCode(VSCode)[1][3]wasthecodeeditorusedin developing the platform. The IDE supports several features like syntax highlighting, debugging, and integrated version control [2][9]. The VS Code extension ecosystem allows other tools like ESLint to check code quality and Prettier to format code so that development practices run smoothly and yield quality code [7][12].

IV. SYSTEM OVERVIEW

VideoCallingInterviewPlatformisanewplatformthatcanprovide simple video interviews for recruitment [4][5]. By providing live video communication and intelligent capabilities, the platform can provide an easy-to-use interface to interviewers and candidates in a secure and seamless experience [8][10]. The platform employs cutting-edge technologies to provide video calls, screen sharing, recording, and customized interview flows [1][9].

A. UserInterface(UI)

The user interface (UI) is built user-friendly, intuitive, and responsive such that the interviewers and candidates can easilybrowsethroughtheplatform.Theinterfaceutilizesthe latest web technologies like React, Tailwind CSS, and Shadcn to have a clean and interactive appearance. Amongst the most important features of the UI are:

1) Personalized Dashboard: For interviewers and candidates to see and access for scheduling their calendar,lookingaheadatupcominginterviews,and seeing recorded sessions [4][7].
2) Real-time Video Calling: High-definition and unjammedvideocallingwithendcall,videooff,and mute [6][9].
3) Screen Sharing and Recording: Candidate and interviewer screen share for real-time presentation or demo,andrecordingsessionsforfutureanalysis[8][11].
4) Interactive Chat: Interview feature built in between candidateandinterviewerforsharingofconversation during an interview [7][12].
5) Notifications:Pushnotificationsinsideappaboutan interviewtobetakenoraninterviewingtaskpending [10][13].
6) ResponsiveDesign:Ithasbeencreatedkeepinginmind desktop,tablet,andsmartphoneandrespondswellonall three of them [2][5].

B. Backend Architecture

The backend of Video Calling Interview Platform isscalable, real-time communications-enabled, and secure as the data management point. Stream, Convex, and Firebase technologiesareutilizedinmanagingdatastorage,videocall streams, and real-time synchronizations. Following supportis maintained by the backend system:

1) Data Storage: Interview schedules, user information, chathistory,andrecordedvideosareallsecurelystored in a database like Firebase or MongoDB [3][5].
2) Real-Time Communication: Stream is utilized to facilitatevideocallsandreal-timemessagingbetweenthe interviewer and candidate [8][12].
3) Video Recording: All video interviews recorded are securelystoredandcanbereplayedoranalyzedforfuture use [6][11].
4) UserAuthenticationandAuthorization:Clerkisused for secure and hassle-free user authentication, allowing interviewers and candidates to log in and access their profiles using the single sign-on feature [4][7].
5) Scalability: The system is built to scale, allowing for multiplesimultaneousinterviewswithoutdegradationin performance [10][13].
6) SessionManagement:Ongoinginterviewsessionsare proctored and managed in real time, ensuring that unauthorized users cannot access live video calls or recordings [6][13].

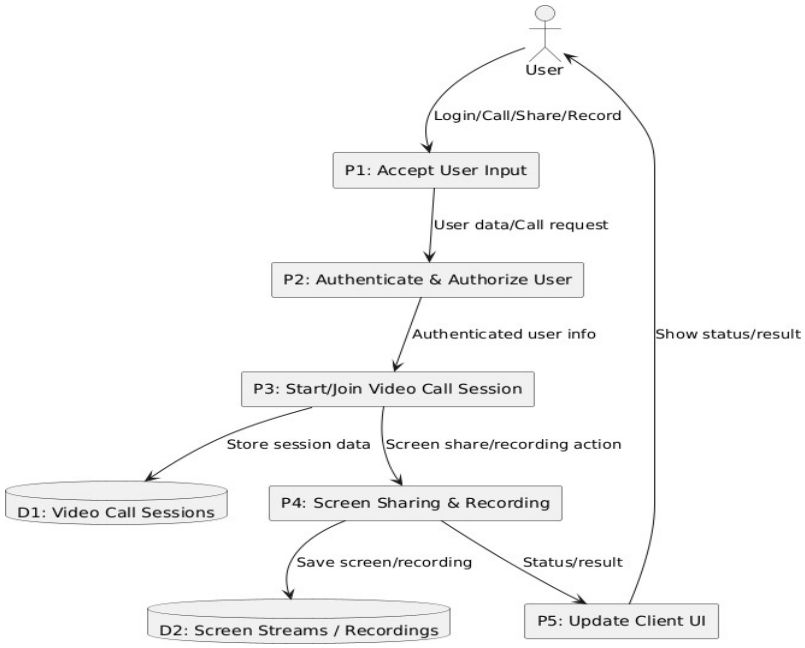


Fig.3-DFDDiagram

C. KeyFeatures

Theplatformautomatessomeofthemostimportantfeatures for both candidates and interviewers:

1) InterviewScheduling: Interviewersscheduleinterviews, show calendars, and send reminders with calendar syncing to invite candidates [9][14].
2) Real-Time Video Interviewing: HD video meetings withresolvablevideo,noisereduction,andlow-latency for smooth interviews [7][12].
3) ScreenSharing:Boththecandidateandinterviewercan share it, and this keeps the interview interactive and interesting [6][13].
4) SessionRecording:Theinterviewscanberecordedand stored as reference or held on file or viewed later. It is useful in case of future feedback or performance review [5][11].
5) Interactive Tools: The platform also gains by the additionoflivepolls,surveys,orcodingchallengesthat make the interview interactive [8][15].
6) Customizable Interview Workflows: Interview flow can be tailored by interviewers through pre-determined questions,auto-tests,orpre-settaskstoberunduringthe call [10][16].

D. DataProcessingandPersonalization

The site handles user data (i.e., interview history, interests, and feedback) to create personalized experiences for both theinterviewersandthecandidates.Drawingfrommachine learning and data analysis, the system offers:

1) Personalized Interview Schedules: Drawing from previous interviewhistoryandavailability,schedulinginanefficientmanner for both interviewers and candidates [8][13].
2) SmartInterviewRecommendations:Interviewguidelinesto interviewers from candidate information like experience and position, as customized interview questions [9][15].
3) Interview Analytics: Post-interview feedback and performance analyticsforinterviewersandcandidates,offeringvaluableinsights for improvement [7][10].

E. IntegrationofThird-PartyAPIs

Theplatformenhancesabilityandsimplifiesinterviewingby integrating third-party APIs:

1) CalendarAPI:Facilitatesauto-schedulingofinterviews, scheduling with users' calendars, and reminders [12][16].
2) EmailandSMSAPI:Forreminderforaninterview, confirmation of a meeting, and alerts [14][17].
3) Video Streaming API: Stream, with real-time video calling support,haslow-delayhigh-definitionvideostreaming[5][20].
4) Speech-to-TextAPI:Togeneratetranscriptionsofinterviewsto refer later or analyze [6][18].
5) FileSharingAPIs:Toshareresumes,presentationslides,or documents during the interview [13][19].

F. SecurityandPrivacy

Privacy and security are of utmost concern for protecting user data, in the form of professional and personal confidential information. The site is enacting strict data protectionnormslikeGDPR,providinganonymizationand:

1) End-to-EndEncryption:Protectsvideocalls,chat,and all content shared from unwanted users [9][14].
2) DataPrivacy:Therearestrictprivacypoliciesonthe site, and user data is dealt with openly and securely. Personal data is anonymized and encrypted wherever necessary [7][13].
3) Role-Based Access Control: Controls a specific interview session and data access (e.g., candidates or interviewers)tobeusedonlybyallowedusers[10][15].
4) SessionIntegrity:Constantsecurityauditandtesting ensure the platform to be free of vulnerabilities, providing a secure environment to hold interviews [11][16].

V. ANALYSIS

Oneofthemainproblemsoftoday'srecruitmentisalackofquality videointerviewsystemswithsimple,secure,andaccessiblemethod for interviewers and applicants. The research investigates the reasons which deter companies and applicants from utilizing video interviews,takingintoaccounttheroleofpooraccessibilitytothese systems, and likely influence on the recruitment process. The research attempts to critically analyze failed interview solution experience and candidate recruiter misadventure experiences using systematic literature review and research.

Theresearchbeginsbyoutliningtheimplicationoflimitedaccessto video calling destinations for recruitment interviews. The research assesses the effect on the success of recruitment, such as increased recruitment time, failure to objectively screen the candidates, and increased administrative burden. The research outlines the psychological and logistical effect on the applicants and recruiters, suchasdecreasedconfidence,poorpreparation,andfailuretoplace the candidates in the best possible situation.

Besides,theresearchexaminescandidateandinterviewerexperience problems when video interview platforms are of low quality. The research finds suboptimal video quality features, intermittent connection, bad real-time interaction tools, and non-interview customization. The research also examines the problem of interviewing, screen sharing, recording for feedback, and real-time collaboration tools.

This information also describes how underrepresented groups, technology-constrainedgroups,andremoteemployeesareharderto reach with existing video interview systems. It talks of how gaps restrictcareeropportunities,leadingtolostjobopportunities,biases in hiring, and inefficiency overall in the recruitment process.

MovingForward:HowtoOvercometheChallenges

After completing this analysis, the paper is now ready to be formattedforpublication[4][5].Duplicatethetemplatefileusingthe “SaveAs”function,applyingtheappropriatenamingconventionfor your paper as prescribed by your conference or journal [10]. Once thenewfileiscreated,highlightallthecontents,importthefinalized text, and prepare the document for styling [13]. Utilize the tools in the MS Word formatting toolbar to adjust the document layout and finalize it for submission [14].

VI. CONCLUSION

The Video Calling Interview Platform is a simple and effective solution to the employment requirements of the new. With its advancedfeaturesandsimpletouseinterface,itaimstomakethe interview a walkover for both the candidate and interviewer. The platform's simplicity, security, and integrity are the topmost priorities, and the process from appointment scheduling to providing feedback after the interview is smooth.

Its effectiveness also lies in prioritization of user experience. Its usability and interactive UI and its facility to let the candidate and interviewer easily alternate devices makes it user-friendly. Its smoothvideocalling,screen-sharingfunctions,recordingfacilities, and live chat make it a real true and professional environment for interviewing.

Aside from this, data personalization and data handling functionalitiesarealsoincludedinthesystem.Itwillbeveryeasy for interviewers to conduct and administer interviews, and candidates will be presented favorably with recommended suggestions based on past performance and action. Personalizationincreasestherecruitmentprocessandexperience for everyone.

Thesystemalsoallowscollaborationandcommunicationamong interviewers and the candidate. With its integrated chat feature, screen sharing, and live feedback, the system supports proper communicationandproperconductoftheinterview.Thefeatures support proper communication and participatory interviewing process.

Lastly,theVideoCallingInterviewPlatformisagreatinnovation of video employment interviews on a secure, quick, and easy platform for recruitment. With its integration of video calling, livefunctionality,andquickprocessingofdata,theplatformcan potentially provide an end-to-end and interactive interviewing process that optimizes hiring and candidate satisfaction.

VII. FUTURE WORK

The Calling Video Interviewing Platform is extremely likely to be built and deployed in the immediate future. There is a way of development,andthatisAItechnologieslikemachinelearning, which have the capability of monitoring real-time video interviews anddrawingusefulinferencesfromcandidates'performances.Tone, nonverbal interaction, andlevels of engagement wouldbe analyzed throughAIinordertopromptinterviewerstorendermoreunbiased decisions. Customer experiences can further be enhanced by leveraging data analytics strength to tailor the interview questions, recommendpropertestsaccordingtocandidateprofile,andprovide custom feedback to interviewers and candidates.

Virtual Reality (VR) and Augmented Reality (AR) offer more potential for development in the future, with interactive, immersive interviewing enabling candidates to demonstrate skill in engaging, immersive settings. Technical testing can, for example, use VR simulation,andARcanbringreal-timeinformationoverlaysintothe interviewing setting. Another area that needs improvement is the creation of more advanced video capture and review functionality, like automatic transcription, sentiment analysis, and keyword tagging.Thiswouldminimizeinterviewingtimebyfacilitatingrapid search of recorded interviews and allowing interviewers to view actionable information.

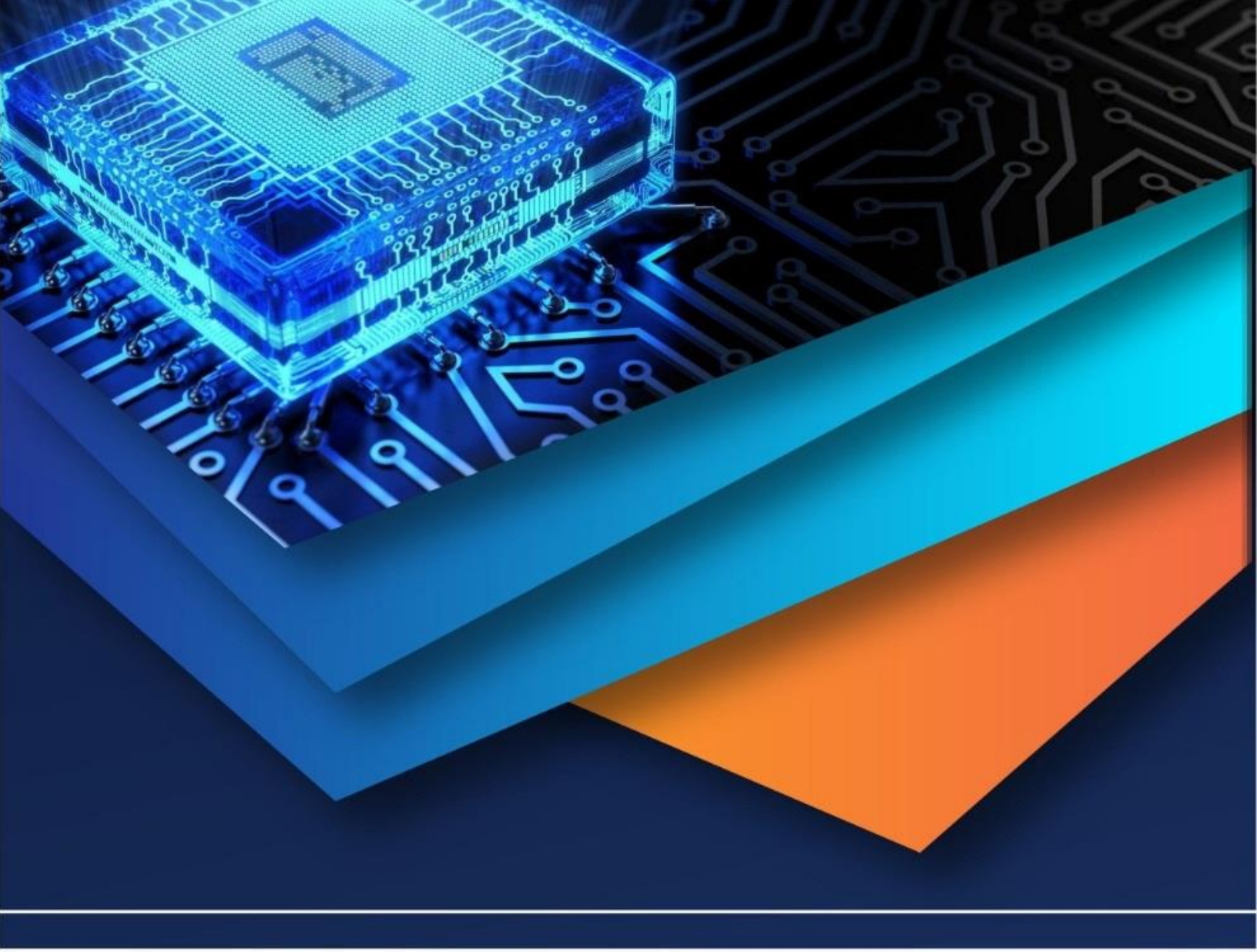
Moreover,thesupportforinteroperabilityincurrenttechnology,i.e., AI-basedchatbots, wouldallowthepre-screeningquestionnaires or teststobecapableofhelpingtheinterviewersscreenthecandidates independently. Other routine innovations in security and user authentication will also be needed, maintaining the site always secure,safe,andinaccordancewithdataprotectionlegislation.Asit grows, it will build an increasingly customized, frictionless, and interactiveinterviewexperiencetotheadvantageofinterviewersand candidates by streamlining interviewing as well as the hiring decision-making process.

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