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AI Workroom: An Intelligent Platform for AI-Enhanced Meeting Experiences

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Abstract: ***This paper introduces the creation of "AI-Workroom," a smart virtual conference app developed on TypeScript and driven by Zego Cloud APIs. The main aim of this project is to support remote collaboration, especially in working and learning environments. AI-Workroom supports basic virtual conferencing features like meeting setup and entry, screen sharing, video and audio communication, and real-time texting . Some of the key highlights in the new system is integrating an AI workspace, completing a meeting and people with AI capability to create images and a whiteboard to utilize visual explanations to present something. The AI image creation module allows users to create images for specified subjects and topics in real-time that drastically lowers the necessity of finding images outside, this module was created on the foundation of the Hugging Face API. The interactive whiteboard contains simple drawing instruments such as a pencil, eraser, and text box which allows teachers and presenters to represent ideas and thoughts in an instant. Robust user authentication and data management is done via Firebase, with Google Authentication providing secure access. AI-Workroom seeks to revolutionize the model of engagement between teachers and students in virtual space integrated with visual aids***

Keywords: AI-Powered Learning Tools, Human-AI Interaction, Smart Meeting Tools, AI in Education, User Authentication, Virtual Collaboration.

I. INTRODUCTION

The rapid advancement of digital technologies has significantly transformed how people collaborate or share information in academic and career-oriented contexts. This paper presents “AI-Workroom,” a multifunctional virtual conference system designed in TypeScript and powered by Zego Cloud Services (API) to cater for the challenges of intelligence and effectiveness in virtual interactions. This platform supports basic video conferencing functions, including meeting creation and joining, screen sharing, audiovisual communication, and instant text chatting, enabling fluid real-time collaboration. The most notable advancement of AI-Workroom is its AI-enhanced workspace which includes an AI image generation module as well as an interactive whiteboard. The image generation module, featuring the Hugging Face API, allows users to create relevant topic images instantly, thereby reducing reliance on other platforms for explanation illustrations. The interactive whiteboard allows users, especially instructors, to draw and explain concepts as they happen using a pencil, eraser, and text tools. In regard to secured access and data control, the application uses Firebase real-time database and Google Authentication for user verification to manage and secure system resources. AI-Workroom, by enhancing traditional virtual meeting applications through intelligent AI capabilities, is able to create more efficient collaborative environments.

II. LITERATURE REVIEW

1) *Photorealistic Text-to-Image Diffusion Models with Deep Language Understanding • Authors: C. Saharia, W. Chan, S. Saxena, et al. • Source: arXiv preprint, arXiv:2205.11487, 2022*

Summary: This paper presents a cutting-edge procedure for creating photorealistic pictures from printed input utilizing dissemination models combined with profound dialect understanding. The approach marks a critical change in terms of picture authenticity and arrangement with input content portrayals. Be that as it may, the demonstrate is computationally seriously and requires high-performance equipment to run successfully, making real-time or large-scale applications challenging.

2) *Virtual Whiteboard • Authors: T. Padihar, V. Patidar, V. Bhalapurkar, and M. Patidar • Source: ResearchGate. [Online]. Available: https://www.researchgate.net/publication/370377118_VIRTUAL_WHITE_BOARD. [Accessed: Sep. 15, 2024].*

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3) A Virtual Meeting System for the New Age • Authors: Antonios G. Nanos and Anne E. James • Source: ResearchGate, 2013

Summary: This paper explores the plan and usefulness of a comprehensive virtual assembly framework that joins real-time video conferencing, record sharing, and communication apparatuses in a single stage. It addresses issues such as arrange idleness, security, and versatility by proposing versatile communication conventions and information encryption. Whereas the paper traces potential applications in both scholarly and corporate settings and notices future integrative like AR and AI, it needs current innovative executions and framework models.

4) The Role of Virtual Whiteboards in Modern Classroom • Author: Kevin Fuchs • Source: IJSREM, 2021

Summary: This investigate highlights how virtual whiteboards have revolutionized the classroom by advancing intelligently and collaborative learning. Highlights like real-time comment, mixed media back, and inaccessible get to are emphasized as key donors to upgraded instructing methodologies such as gather talks and problem-solving. Besides, later improvements incorporate AI-powered highlights and versatile learning devices that back personalized learning encounters. In any case, far reaching viability depends on get to to advanced foundation and client versatility..

5) AI-Powered Virtual Classrooms for Enhanced Remote Learning • Authors: J. Lee, S. Chen, and A. Patel • Source: International Journal of Educational Technology, 2021

Summary: This paper investigates the integration of AI instruments in virtual classrooms to upgrade inaccessible learning encounters. The creators highlight AI-based picture era, real-time substance adjustment, and intelligently learning devices that help both instructors and understudies in keeping up engagement. The think about appears that leveraging AI in virtual situations progresses the clarity of complex subjects and permits for personalized learning encounters. In any case, challenges stay in guaranteeing availability and reasonableness for all clients, particularly in districts with constrained assets. This paper serves as an motivation for coordination AI-based instruments like picture era in virtual assembly stages for instruction.

6) AI-Driven Collaborative Platforms for Education and Business • Authors: P. Kumar, M. Smith, R. Rodriguez, and E. Lee • Source: Journal of Digital Collaboration, 2022

Summary: This research paper examines AI-enhanced collaborative platforms for both education and business applications. The focus is on how AI tools can augment communication and workflow, providing real-time insights, content generation, and task automation. One of the key findings is that platforms integrating AI-driven image generation, whiteboards, and automated tools greatly improve meeting efficiency and user experience. The paper discusses various approaches for integrating such AI tools, including AI image generation from textual prompts, which closely aligns with the AI-Workroom project's goal to improve collaboration through visual aids.

7) Revolutionizing Remote Collaboration with Virtual Whiteboards and AI • Authors: L. K. Narayan, D. Patel, A. Verma • Source: Advances in Communication Technologies, 2020

Summary: This paper analyzes the transformative influence of virtual whiteboards and AI on blocked off collaboration. Emphasizing the noteworthiness of lively, scholarly people gadgets like AI-assisted drawing, substance comment, and picture time, the paper examines how these developments make virtual collaboration more fruitful in educator and capable settings. The ask around reinforces the headway of a feature-rich organize like AI-Workroom, where AI-generated substance and characteristic whiteboard functionalities are reliably facilitates to enhance teaching and learning techniques.

Comparative Analysis

Sr. No.	Research Paper Title	Proposed Methodology	Drawbacks
1	Photorealistic Text-to-Image Diffusion Models with Deep Language Understanding (2022)	Uses diffusion models combined with deep language understanding to generate highly realistic images.	High computational cost; not suitable for real-time or large-scale deployment.

2	Virtual Whiteboard (2024)	Implements a digital whiteboard interface to support collaborative explanation and real-time interaction.	Performance relies heavily on user device and internet quality.
3	The Role of Virtual Whiteboards in Modern Classroom (2021)	Promotes interactive learning via real-time annotations and multimedia support.	Requires strong digital infrastructure; user adaptability is a challenge.
4	AI-Powered Virtual Classrooms for Enhanced Remote Learning (2021)	Integrates AI tools like image generation and adaptive content to personalize remote education.	Accessibility and affordability are major concerns in under-resourced areas.
5	AI-Driven Collaborative Platforms for Education and Business (2022)	Enhances collaboration through AI-generated content, task automation, and interactive tools.	Integration complexity; may require extensive setup and training for users.

III. METHODOLOGY

A. Research Methodology

This inquire about embraces a user-centered improvement approach for planning and executing AI-Workroom, an brilliantly virtual assembly and collaboration stage. The framework is built utilizing TypeScript, with integration of third-party administrations such as Zego Cloud API for real-time video conferencing functionalities. The technique includes planning two major components: a virtual assembly environment and an AI-powered workspace. The virtual assembly framework permits clients to make or connect gatherings with highlights like screen sharing, sound, video, and text chat.

Within the AI-Workroom area, progressed modules were executed counting:

1) AI Picture Era

- Coordinates utilizing the Embracing Confront API, this module creates relevantly pertinent pictures from user-input prompts to help in visual clarifications amid gatherings.

2) Virtual Whiteboard:

- Made with disobedient such as pencil, eraser, and substance value to duplicate real-time, scholarly people teaching or conceptualizing.
- For secure client organization and affirmation, Firebase was utilized adjacent Google Sign-In, ensuring solid get to control and data managing with. The total system was laid out with versatility and responsiveness in judgment skills, catering to both understudies and specialists in teacher and collaborative settings.

B. Data Collection

1) Prompt-based Input Collection: Scholarly prompts given by clients in the midst of get-togethers for creating AI pictures through the Grasping Stand up to API.

2) Client Interaction Logs: Assembly creation, record interaction, and whiteboard utilization occasions are put away in Firebase, making a difference in understanding framework utilization and execution designs.

3) Visual Yields: AI-generated pictures and whiteboard substance serve as energetic yields, shaping the premise for evaluation of highlight significance and utility. All user-generated substance is safely put away and overseen utilizing Firebase Realtime Database, permitting for steady execution following and highlight approval in real-world utilization scenarios.

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C. Analytical Techniques

The viability of AI-Workroom was evaluated through a blend of useful testing and client input investigation. Key explanatory strategies included:

Convenience Testing: Assessed how naturally clients may make gatherings, utilize the whiteboard, and create pictures.

Security Evaluation: Confirmed the adequacy of Firebase Verification in securing client get to and overseeing sessions.

Flowchart

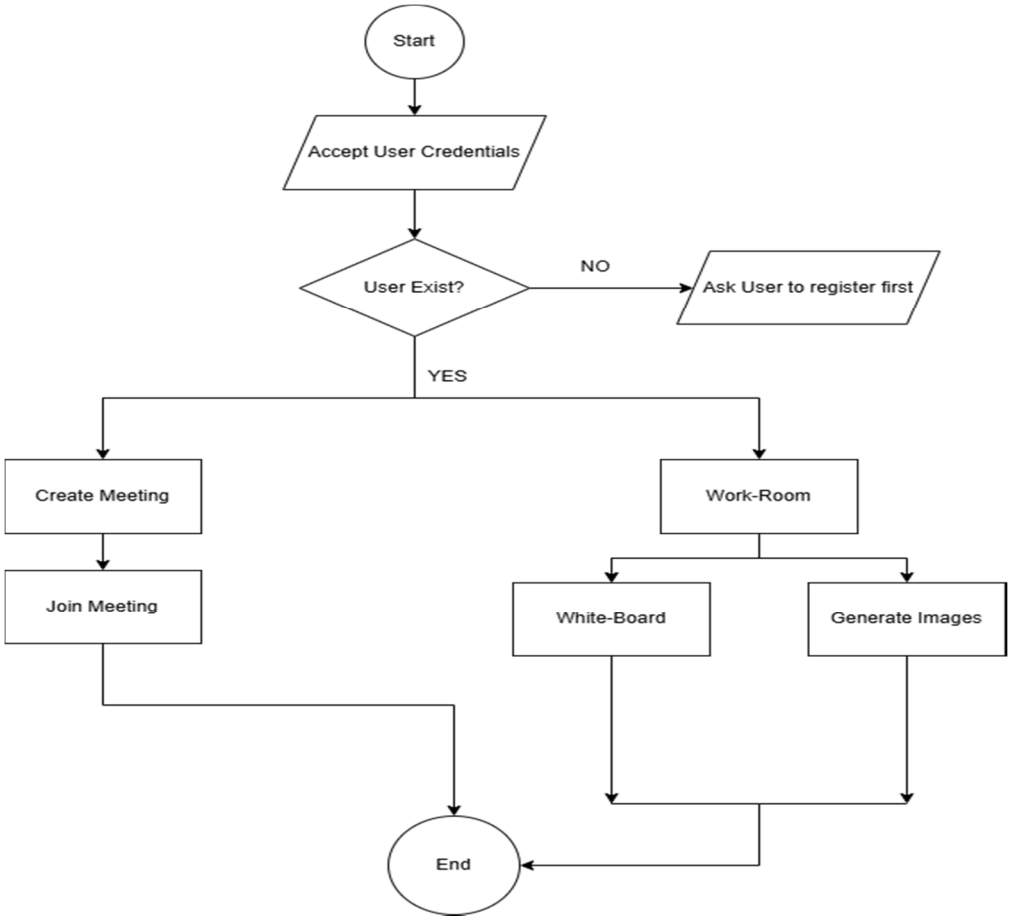

Fig. 3.1 Flow Chart

The methodology revolves around making an cleverly and collaborative advanced workroom, joining virtual assembly functionalities with AI-powered picture era and an intuitively whiteboard. The method starts when a client gets to the stage and is incited to enter their login accreditations. Upon accommodation, the framework confirms whether the client is as of now enrolled. In case the client exists, they are allowed get to; something else, the stage demands the client to total a enrollment prepare.Once verified, clients are displayed with two alternatives: they can either make a unused assembly, getting to be the have, or join an existing session employing a-code.

After effectively entering or starting a assembly, clients are explored to the central workspace called the “Workroom.” This space offers a advanced whiteboard where clients can draw, compose, and explain utilizing instruments like a pencil, eraser, and content input, improving real-time collaboration. In expansion to this, a one of a kind AI-powered highlight is implanted into the interface that permits clients to input a text provoke and produce relevantly pertinent pictures employing a generative AI show. These pictures are shown on the correct side of the interface and can be utilized to bolster instructing, clarifying complex points, or enhancing dialogs. The system concludes the session when the collaboration is add up to, ensuring a organized and user-centric workflow. In common, the expand combines secure client confirmation, adaptable gathering organization, real-time drawing devices, and AI picture time to create a sharp, intellectuals, and future-ready collaborative environment.

IV. SYSTEM ARCHITECTURE

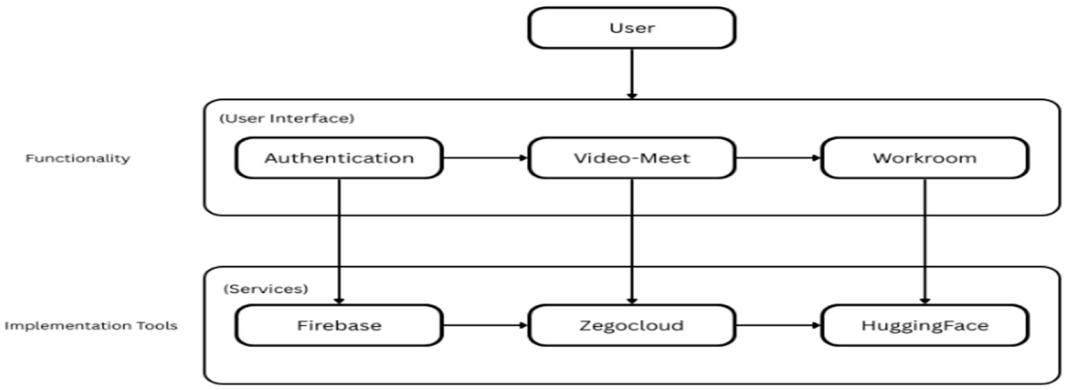

Fig. 4.1 System Architecture

The AI Workroom architecture has been purposefully designed for creating a strong and integrated platform enabling real-time collaborative communication. The principal functions are housed under the same shell—Authentication, Video-Meet, and Workroom—ensuring a seamless and fluent user journey. The very core of this architecture centers around the User Interface layer, wherein the user securely logs in, initiates video meetings with great quality, or participates in such meetings, and collaborates within an AI-enhanced virtual workroom. The user-friendly interface simplifies access to all the features while maintaining smooth interaction across modules. There is a Service Layer that supports the interface, which brings in powerful backend tools that work as the spine of the application. Firebase provides security for the user log-in; manages a real-time-database; keeps users in session within the application, ensuring data consistency and user reliability; ZegoCloud runs the video conferencing model, where real smooth and stable audio-video communication is maintained, even in low-bandwidth modes; HuggingFace integrates seamlessly into the Workroom to bring real-time generative AI features: from text-image transformation to collaborative enhancement and creativity during virtual sessions. The current architecture is layered, supporting different modules with nearly equal importance, thereby extending future development flexibility. The use of these modern technologies distinguishes the AI Workroom as next-generation collaborative environment aiming to reduce tool fragmentation, enhance team productivity, and improve the overall digital workspace experience. In effect, the architecture fosters an interactive and fun environment that allows instant sharing and visualization of ideas. In essence, it redefines the experience of virtual collaboration in academic and professional environments while setting the bar for intuitive and intelligent team interaction.

V. EXPERIMENTATION & RESULTS

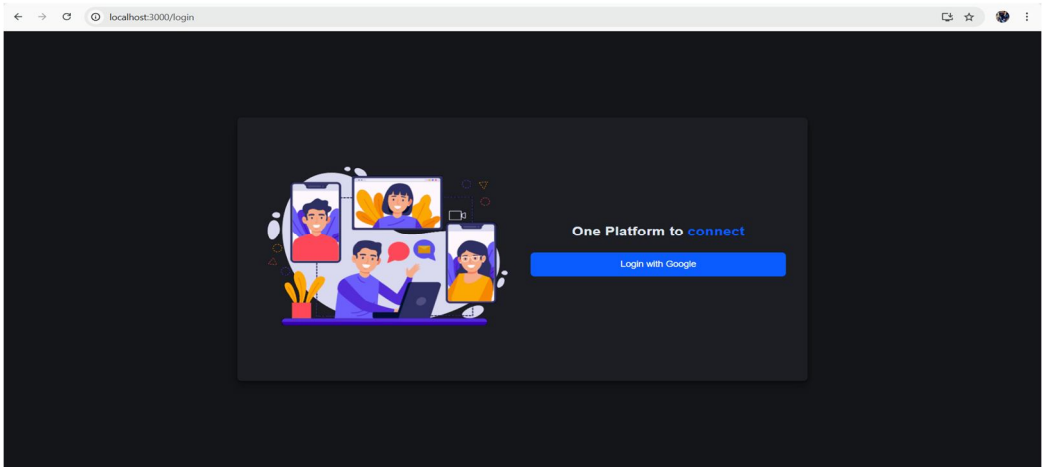

FIGURE 5.1 AI - Workroom Dashboard

Figure 5.1 shows the most dashboard interface of the AI - Workroom application, which serves as the central center for overseeing virtual gatherings. The dashboard is planned with effortlessness and user-friendliness in intellect, advertising three essential choices: "Create Meetings", "My Meetings", and "Meetings". These alternatives permit clients to rapidly make modern gatherings, see the gatherings they have organized, or get to gatherings they have been welcomed to. The interface guarantees that both instructors and understudies can productively explore and oversee their virtual classroom or collaborative sessions without any perplexity, making it perfect for instructive and proficient utilize.

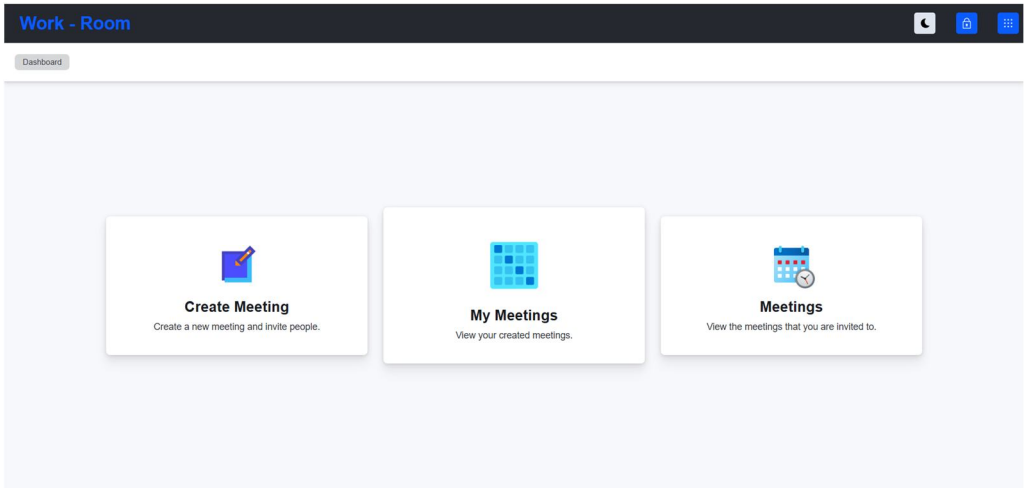

Figure 5.2 Meeting Setup

Figure 5.2 grandstands the screen that shows up after selecting the “Create Meeting” alternative from the dashboard. Clients are displayed with two assembly designs to select from: "Create 1 on 1 Meeting " and "Create Video Conference". The 1-on-1 assembly choice is perfect for private sessions, such as mentoring or doubt-clearing talks between a instructor and a understudy. On the other hand, the video conference alternative is outlined for gather settings, permitting numerous members to connect and collaborate. This adaptability makes the stage appropriate for different educating scenarios, from person coaching to full-scale classroom dialogs, upgrading the virtual learning experience.

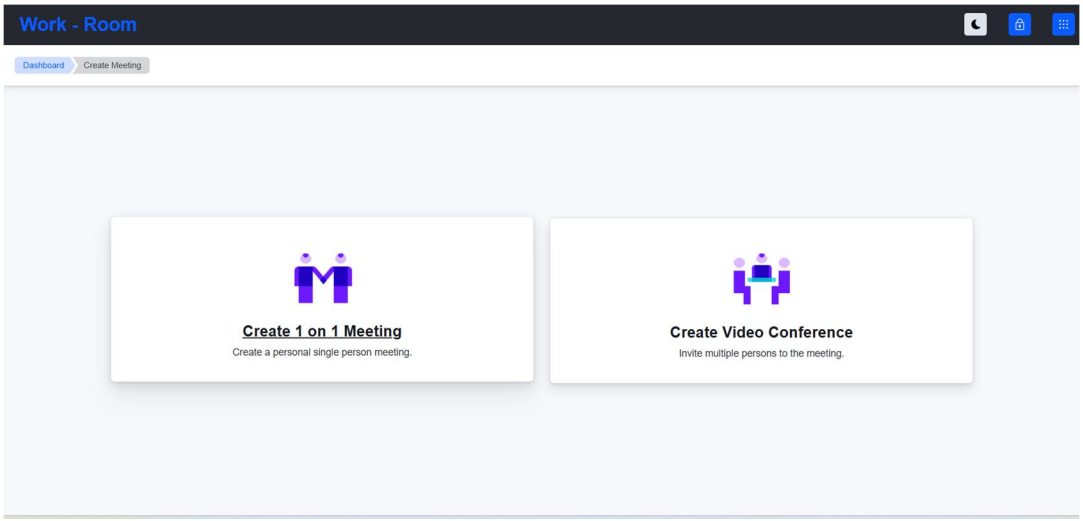

Figure 5.3 Meeting Type Selection Interface

Figure 5.3 This picture once more appears the assembly creation interface, where clients are incited to select between two sorts of virtual gatherings. The "Create 1 on 1 Meeting" choice empowers a coordinate, individual session between two people, which is particularly valuable for mentorship, interviews, or individual doubt-clearing sessions. The "Create Video Conference" alternative permits clients to set up bunch gatherings for collaborative sessions such as classes, gather talks, or group gatherings. The format is moderate and outwardly instinctive, making it simple for clients to choose their craved arrange with fair one press.

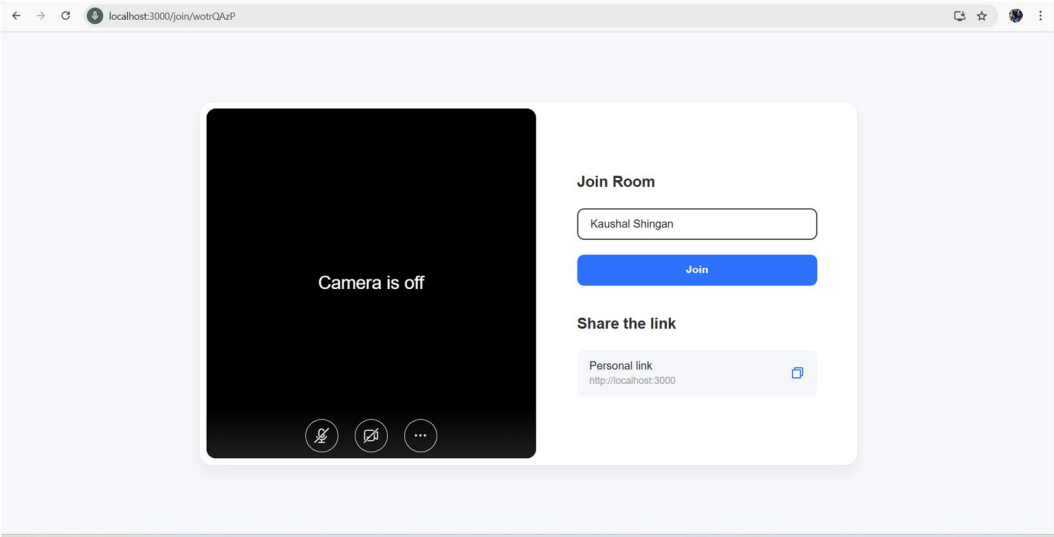

Figure 5.4 Join Room Screen

Figure 5.4 shows the assembly connect interface, where clients can enter their title and connect a virtual assembly room. The cleared out side of the screen shows the video see zone, which remains clear in the event that the camera is off, and incorporates controls to flip the mic, camera, and additional settings. On the proper, the client can input their name, click the Connect button to enter the assembly, additionally share the interesting room connect with others for interest. The clean and useful format guarantees that clients can effortlessly get to and connect gatherings, making the encounter consistent and efficient for both teachers and understudies.

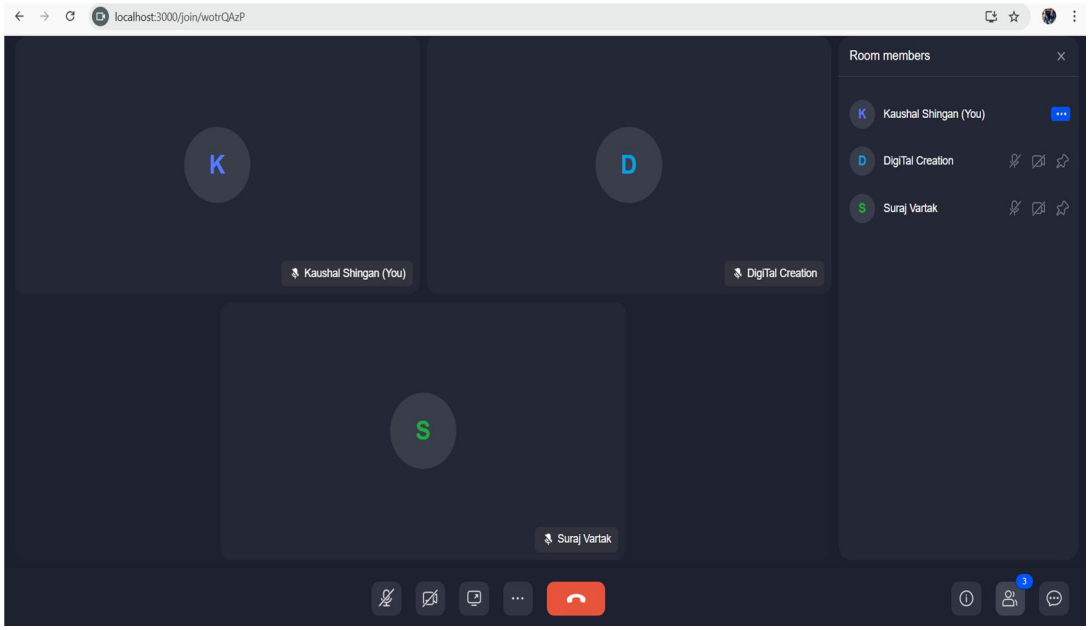

Figure 5.5 Virtual Meeting Interface (Participants View)

Figure 5.5 presents the center virtual assembly interface of AI - Workroom. It shows a lattice format where each member is spoken to in a video outline, with their names clearly labeled. In this specific occurrence, the participants' cameras are off, but the format permits for energetic video spilling when empowered. On the right-hand side, a Room Individuals board records all current members, at the side activity symbols for overseeing their consents such as sound, video, or screen sharing. The foot toolbar gives speedy get to to basic controls counting mouthpiece flip, camera flip, screen share, and the conclusion call button. The dull topic interface improves center and is optimized for long utilization, guaranteeing a comfortable and user-friendly meeting encounter.

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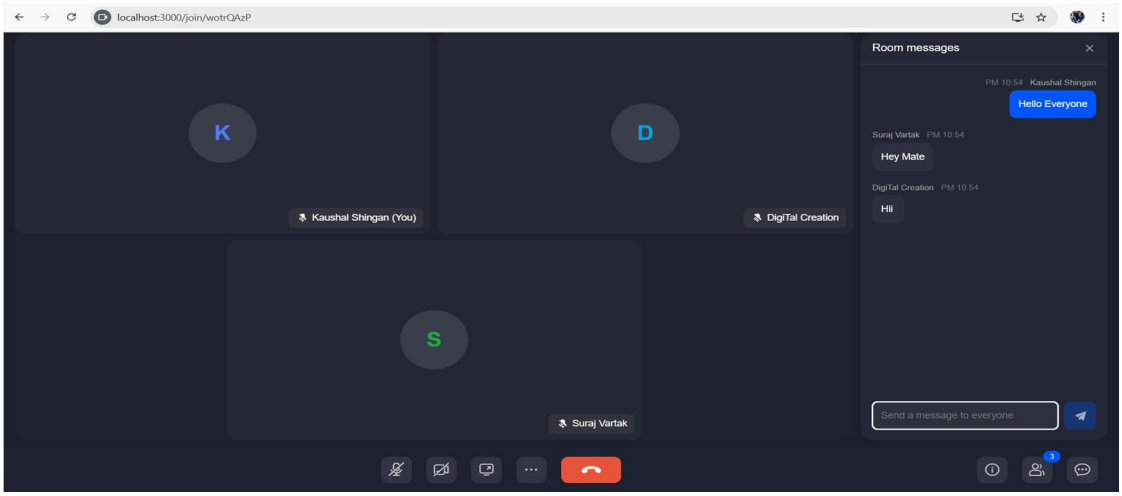

Figure 5.6 Virtual Meeting Interface with Chat Feature

Figure 5.6 shows virtual meeting interface, presently exhibiting the in-built content chat highlight. Whereas the video format remains steady with participants' tiles on the cleared out, the proper board presently shows the Room Messages segment. This permits clients to send and get real-time messages amid the assembly, empowering consistent communication indeed when receivers are off. Each message is timestamped and labeled with the sender's title, making the chat organized and clear. This highlight is particularly valuable in instructive settings where understudies might need to inquire questions or contribute without hindering the progressing clarification. The integration of video, voice, and chat in one screen makes this interface exceedingly effective for collaborative learning and gatherings.

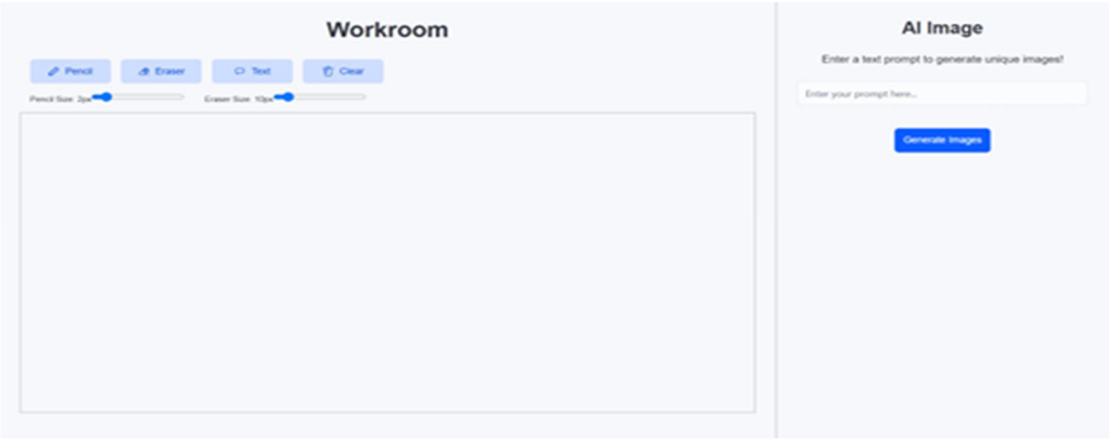

Figure 5.7 Workroom Interface

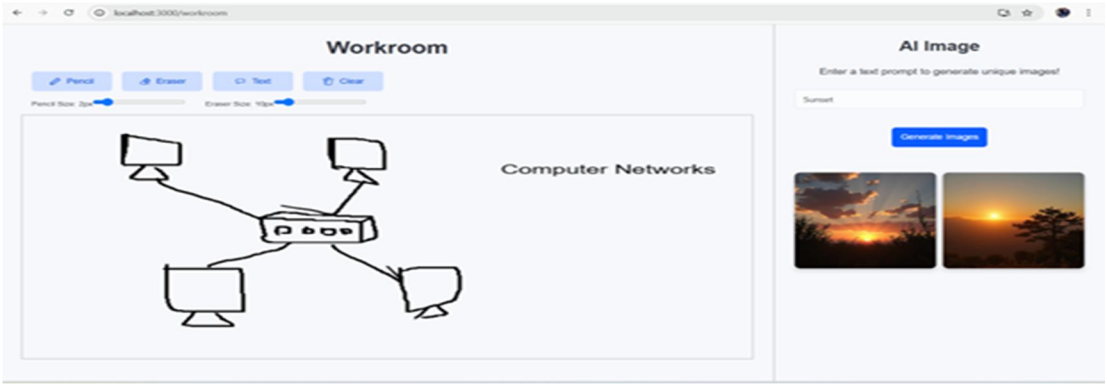

Figure 5.8 Demonstration of Collaborative Whiteboarding and AI- Image Generation

Figure 5.7 and Figure 5.8 grandstand SmartBoard AI, an imaginative web-based collaborative whiteboard device that combines conventional advanced drawing with manufactured intelligence-driven picture era. On the cleared out side of the interface, clients are given with natural drawing instruments such as a pencil, eraser, content input, and clear canvas choices, at the side flexible sizes-for-accuracy.

On the correct side of the interface is the AI Picture era module, where clients can input a content incite (e.g., “Sunset”) to right away produce important and outwardly compelling pictures based on their input. This integration of generative AI locks in users—particularly instructors and students—to update their visual presentations and collaborative learning experiences by combining hand-drawn substance with viable AI-generated visuals. The system is culminate for educator, capable, and creative circumstances where real-time collaboration and concept visualization are crucial.

VI. CONCLUSION

The AI Workroom talks to a basic bounce forward inside the space of virtual get-togethers and real-time collaboration. In an period where blocked off work, online learning, and dispersed bunches are progressively the standard, there's a creating ask for stages that not because it were empower communication but as well develop creative ability, engagement, and proficiency. The utilization of Assistant gives solid affirmation and client administration, ensuring that because it were authorized individuals can get to sensitive gathering substance and collaborate interior alloted spaces. This level of security is essential in building client accept and keeping up data security.In addition, the utilize of Grasping Stand up to APIs for AI-powered picture time presents an innovative edge to the collaboration experience. By allowing clients to form visual substance effectively based on printed prompts, the arrange moves forward the clarity and innovativeness of dialogs. This highlight is particularly valuable in educator and capable circumstances where visual makes a difference play a imperative portion in passing on complex considerations.

The characteristic and responsive client interface of the AI Workroom ensures that clients of all specialized foundations can explore and utilize the arrange reasonably. The bound together interface arranges of the got to be switch between various applications, diminishing cognitive stack and streamlining the by and large workflow. Clients can take an intrigued in social occasions, associated on a collaborative whiteboard, and deliver AI visuals—all interior the same space—thereby making strides capability and center.Flexibility and flexibility are in addition key considerations inside the arrange of the AI Workroom. The organize is built to handle creating client bases and diverse utilize cases, from classroom circumstances to corporate social occasions. Room customization, assent controls, and naturally gadgets make the system versatile adequate to back a wide amplify of collaborative scenarios, regardless of the degree or nature of the group included.

In outline, the AI Workroom not because it were handles the essential challenges of blocked off interaction but as well lifts the virtual collaboration association through cleverly arrange and development. It empowers clients to communicate contemplations more effectively, bolt in more really, and work together more successfully in a progressed space.

VII. ACKNOWLEDGEMENT

We take this opportunity to express our deep sense of gratitude to our project guide and project coordinator Mrs. Poonam Thakre for her continuous guidance and encouragement throughout the duration of our project work. It is especially because of his experience and wonderful knowledge; we can fulfill the requirement of completing the project within the stipulated time. We would also like to thank Mrs. Poonam Thakre, the head of Department of Artificial Intelligence and Machine Learning department, for her encouragement and support. We would also like to thank our principal Dr. J.B. Patil and the management of Universal College of Engineering, Vasai, Mumbai for providing us all the facilities and the work friendly environment. We acknowledge with thanks, the assistance provided by departmental staff, library and lab attendants for their help.

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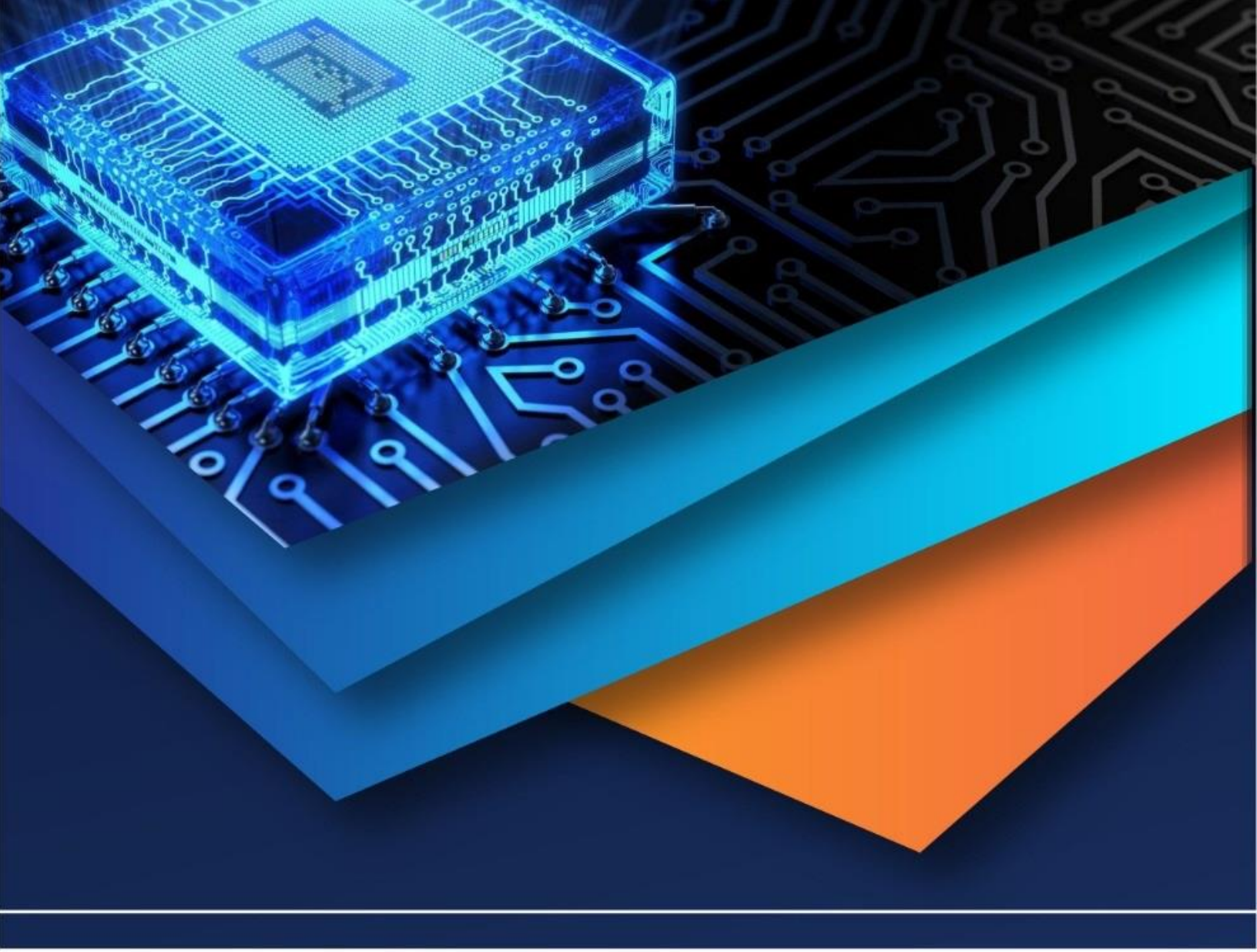

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