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# Mern Enhanced Virtual Event Platform With Ar Integration

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***Abstract:*** The development of a virtual event platform utilizing the MERN stack with integration of augmented reality (AR) to enhance user engagement and interaction. The platform is designed for academics, industry professionals, and global participants to host and attend events such as conferences and exhibitions. Key features of the platform include interactive 3D experiences via AR, real-time communication, and enhanced architectural designs that meet the diverse needs of various users. The study addresses challenges related to ensuring accessibility for all participants, aiming to provide an inclusive and interactive environment for virtual events and fostering global collaboration.

***Keywords*** **- Virtual Event Platform, Augmented Reality, Mern Stack, AI Chat Bot, Unity AR foundation.**

## I. INTRODUCTION

With the elevation of technology, virtual events have become an important part of hosting conferences and networking sessions. The need for engaging and interactive online events has grown, especially after the COVID-19 pandemic. However, many existing virtual event platforms lack interactivity and feel static. To solve this problem, we aim to build a Virtual Event Platform Using MERN Stack with AR (Augmented Reality) integration to create a more immersive and engaging experience. This platform will allow users to attend virtual events, explore 3D environments, and interact with other participants in real time. Unlike traditional platforms that rely on video conferencing and chat, our solution will integrate AR elements, making online events more dynamic and lifelike. The MERN stack (MongoDB, Express.js, React.js, and Node.js) provides a strong and flexible foundation for building a scalable, fast, and user-friendly platform. Key features of the platform will include real-time communication, personalized event schedules, and event analytics to improve user experience and engagement.

By combining modern web technologies with AR-based interactivity, this project aims to enhance virtual events, making them more immersive and effective for both attendees and organizers.

## II. OBJECTIVES

1. Development of an immersive virtual event platform using MERN stack with Augmented Reality (AR) integration to enhance user experience that replicates real-world event experiences.
2. The implementation of real-time communication features such as live chat, chatbot, screen sharing, video conferencing, and networking opportunities enhances user engagement.
3. Customization of event experiences based on user preferences, event type, and industry-specific

requirements. Seamless interaction between attendees, exhibitors, and speakers through AR- enhanced elements.

4. Scalability and performance optimization using the MERN stack for smooth event hosting and user interactions.

## III. PROPOSED METHODOLOGY

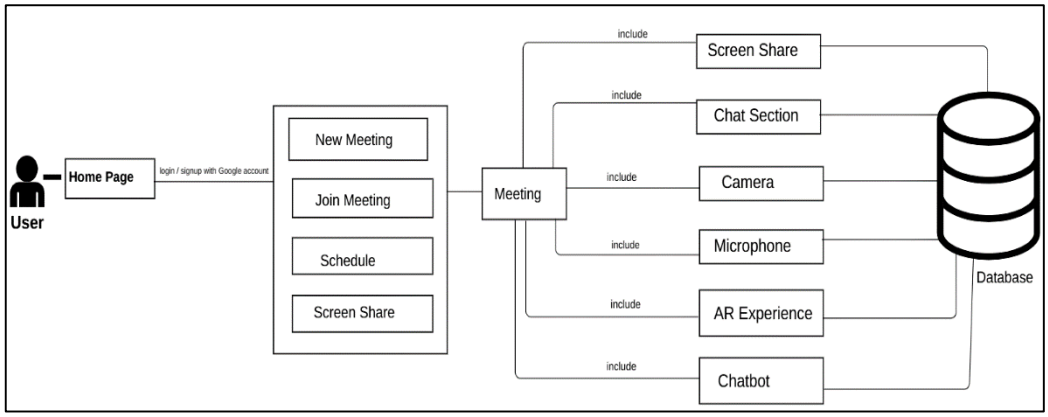


**fig. 1.** proposed system architecture

The virtual event platform is designed using MERN stack (MongoDB, Ex- press.js, React.js, Node.js) with AR integration to enhance online event experiences. The system allows users to host, join, and manage virtual meetings where user interacting with various resources like chatbot and screen-sharing. The platform ensures secure authentication, real-time data management, and interactive engagement through its structured architecture.

The user begins on the Home Page, where they can log in or sign up through the User Authentication system, after authentication, the user gains access to multiple sections like:

❖ **Meeting Functionalities:**

1. Users can create a New Meeting, Join Meeting, or Schedule one.
2. These options lead to the core meeting feature.

❖ **Meeting Features:**

1. Screen Share- It allows users to share their screen.
2. Chat Section- It provides an interface to interact during meetings.
3. Camera- It facilitates video streaming.
4. Microphone- It enables voice communication.
5. AR Experience- It used to integrate augmented reality features for enhanced interactivity.
6. Chatbot- It provides automated assistance.

❖ **Database:**

- All these features connect to a database to store and retrieve relevant meeting data.

This system architecture ensures a structured approach to online events by integrating multiple features with a central database for efficient management. The system efficiently manages data using a user database. With AR integration, users can experience immersive and interactive virtual events, making the platform more progressive for online conferencing and knowledge sharing.

## IV. PROPOSED SYSTEM

The virtual event platform is a web-based application which is built using MERN (MongoDB, Express.js, React.js, Node.js) that enables users to host, attend, and interact in virtual environment.

**Step 1: Define project requirements such as -**

- A react-based VR Meeting Room where users can log in via Google OAuth (without Firebase)
- Create and join meetings with WebRTC
- Enable real-time chat, screen sharing, and video/audio communication
- Integrate VR (WebXR API) for immersive meetings
- Backend: Node.js, Express, Mongo dB, Socket.io, Google OAuth
- Frontend: React, TailwindCSS, Frame Motion, WebRTC, WebXR API

**Step 2: Project Setup-**

- Frontend Setup (React, Tailwind, WebRTC, WebXR API)
- Initialize React APP:
- Install Libraries: sh, copy, npx create- react-app vr-meeting, cd vr-meeting, edit, npm, uuid- Unique meeting ID, socket-io – real-time communication.
- Backend Setup (Node.js, Express, MongoDB, Socket.io, OAuth)
- Initialize backend
- Install dependencies: sh, copy, npm install express mongoose dotenv socket.io, express – web framework, jsonwebtoken- JWT authentication, dotenv- environment variables.
- Bcrypt- Password hashing
- Setup Server (server.js)

**Step 3:** Implement Google OAuth Login

**Step 4:** Implement Meeting Features- create and Join meetings.

**Step 5:** Implement Real-Time Communication (WebRTC & Socket.io) WebRTC Connection (MeetingRoom.js)

**Step 6:** Implement Virtual Room Support that includes Web -XR API & A-Frame.

**Step 7:** Implement Screen Sharing using getDisplayMedia() API

**Step 8:** Install Virtual Room Libraries & WebXR Libraries- Setup React App with sh, copy, edit, npx create-react-app vr-meeting, troika-three-text, a frame- 3 D Web Framework.
@react-three- React wrapper for Three.js @react-three- WebXR API support
Drei- Helper components for Three.js

**Step 9:** Implement 3D Virtual Room-3D Avatar Support using Three.js + for Loading 3D avatars in your AR Environment. Import 3D models in gltf or .glb format Library: three.js

**Step 10:** Deployment- Deploy Frontend- sh, copy, edit, npm run build.
Deploy Backend- sh, copy, edit, nmp Start, Deploy on Render/VPS/AWS.

## V. RESULTS

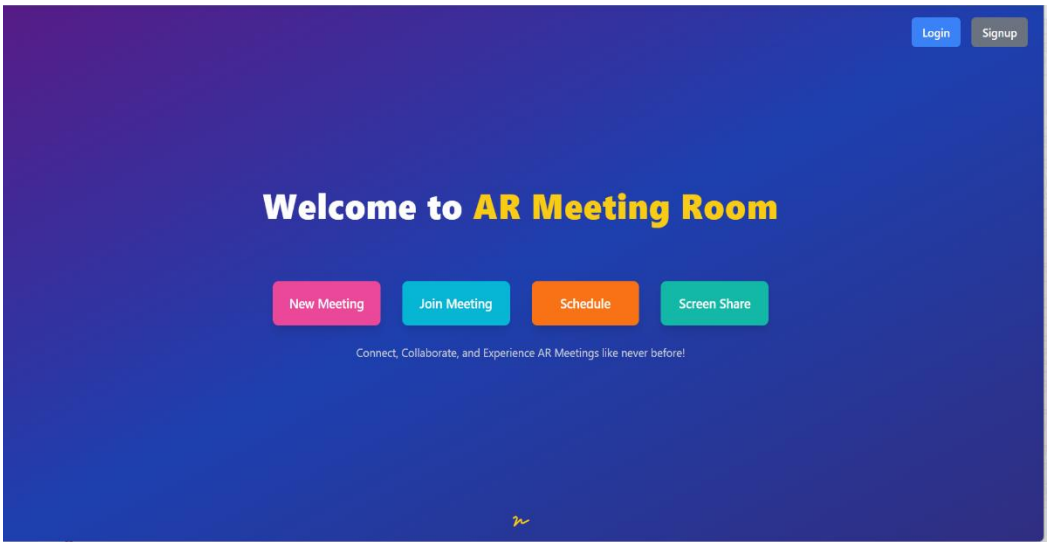


fig.2. home page

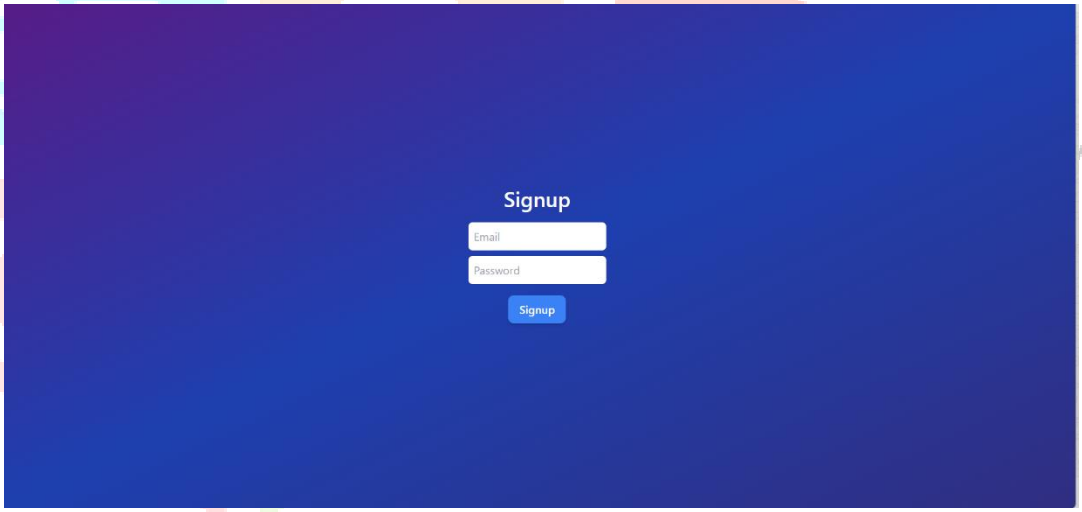


fig.3. sign up page

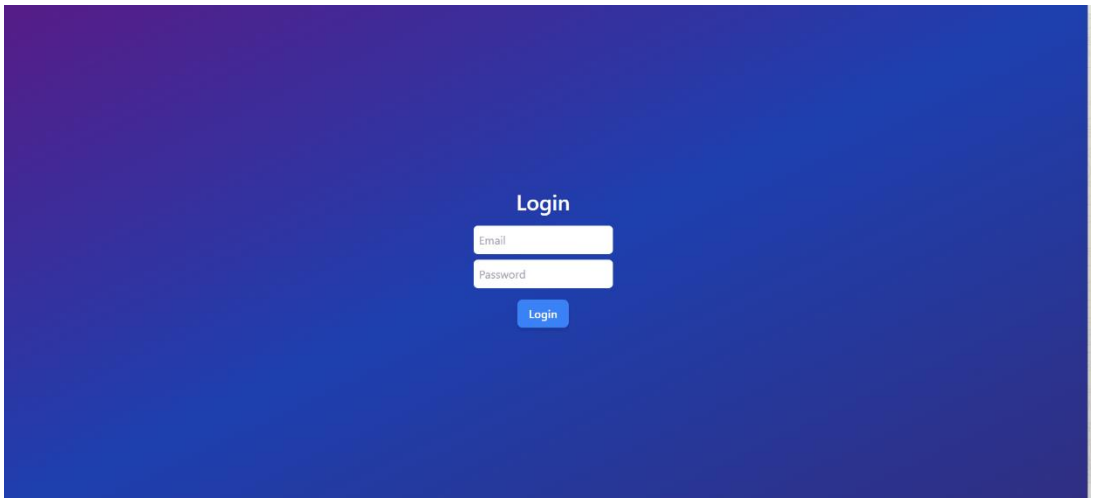


fig.4. login page

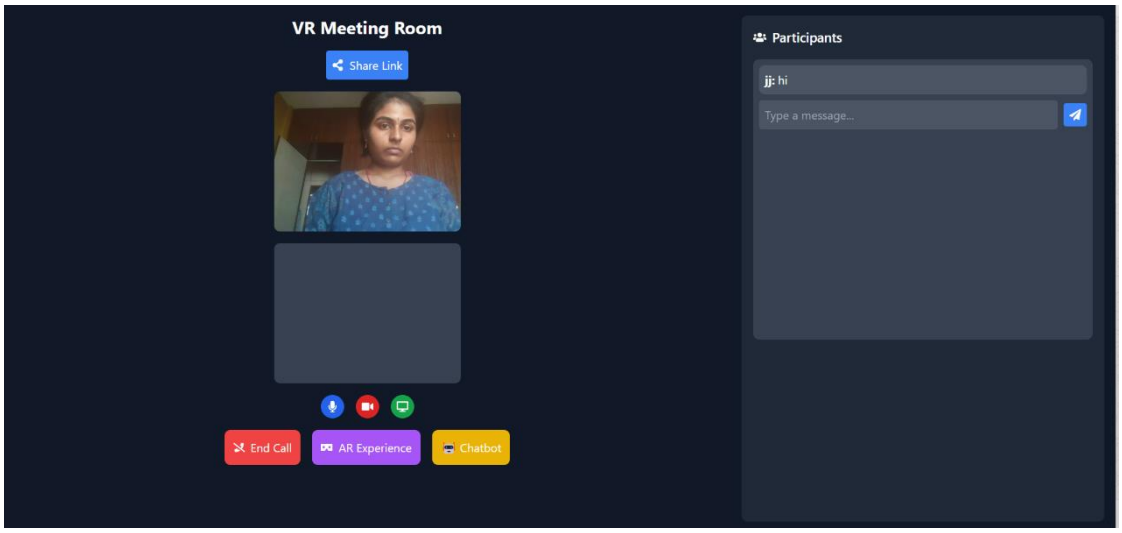


fig.5. virtual meeting room & chat section

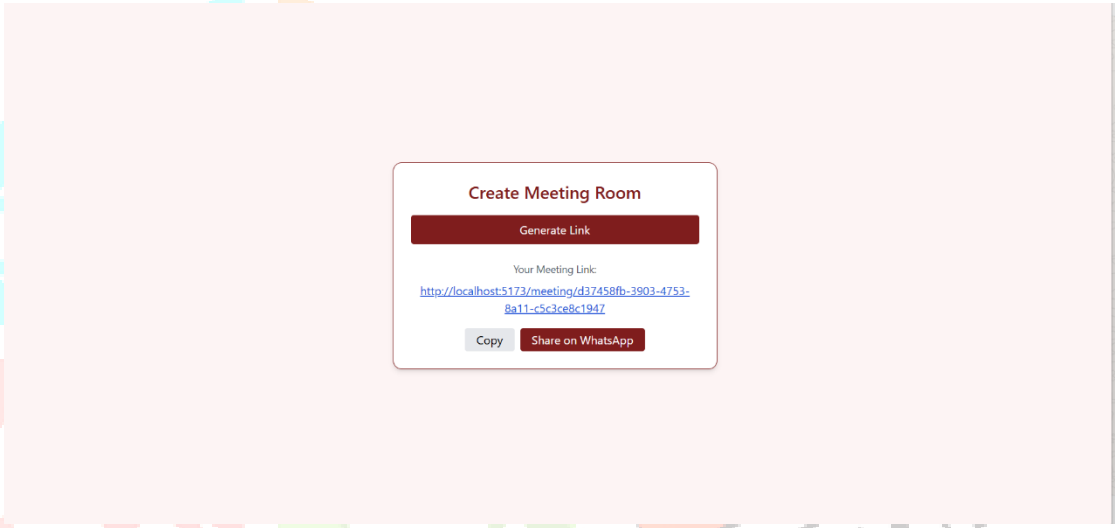


fig.6. generate meeting link

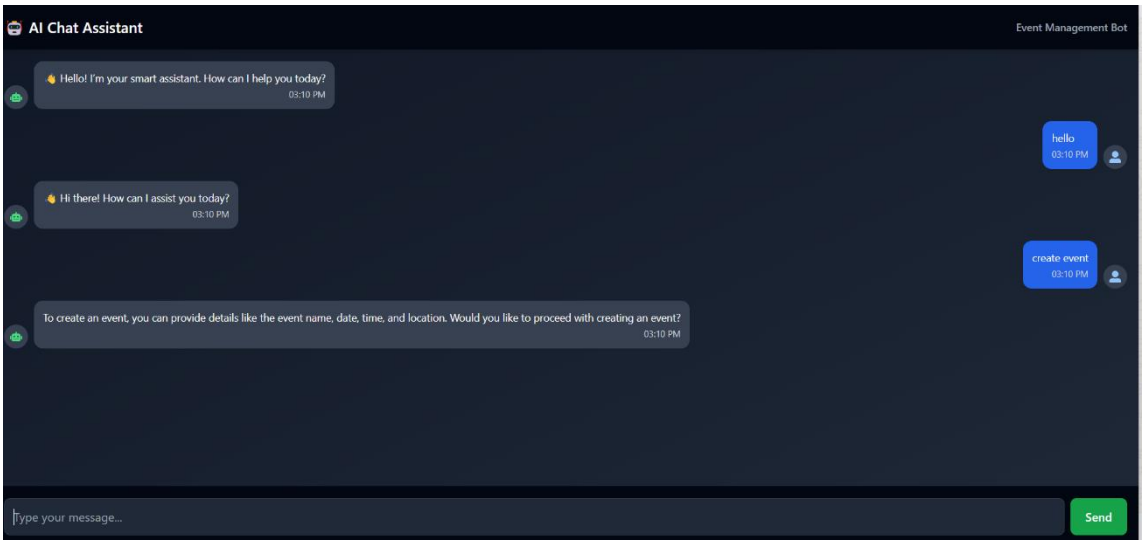


fig.7. chatbot

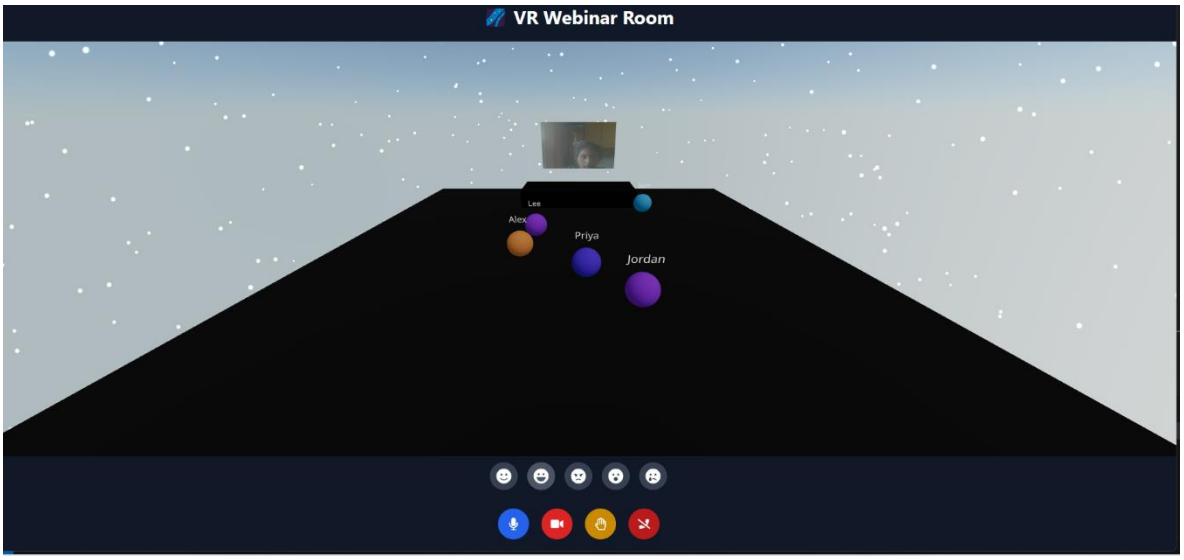


fig.8. ar virtual room

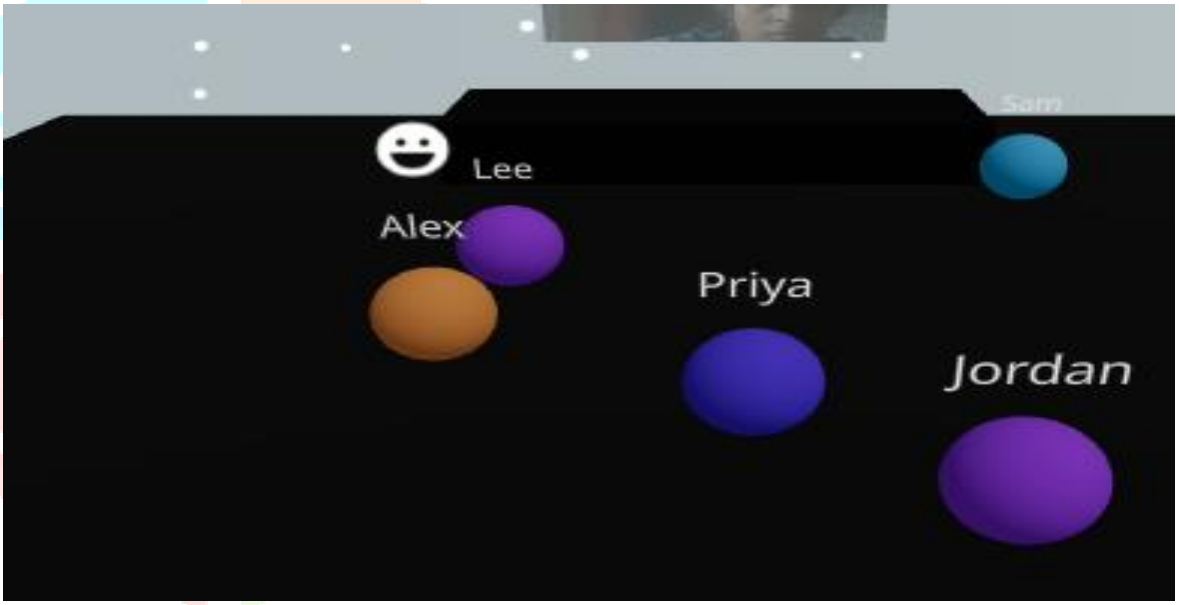


fig.9. 3d avatars and non-verbal communication

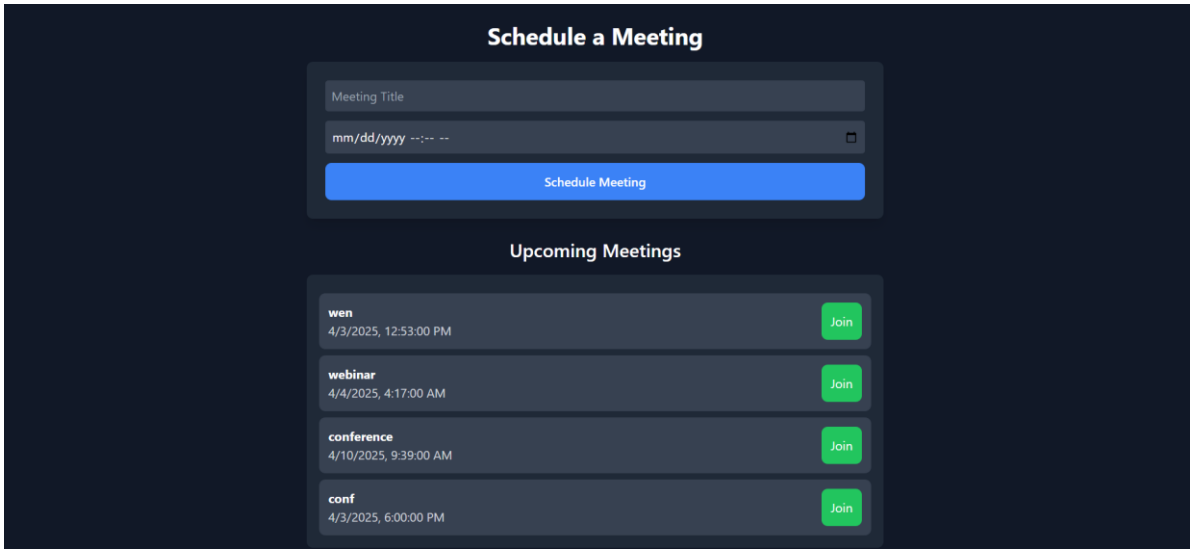


fig.10. schedule meeting

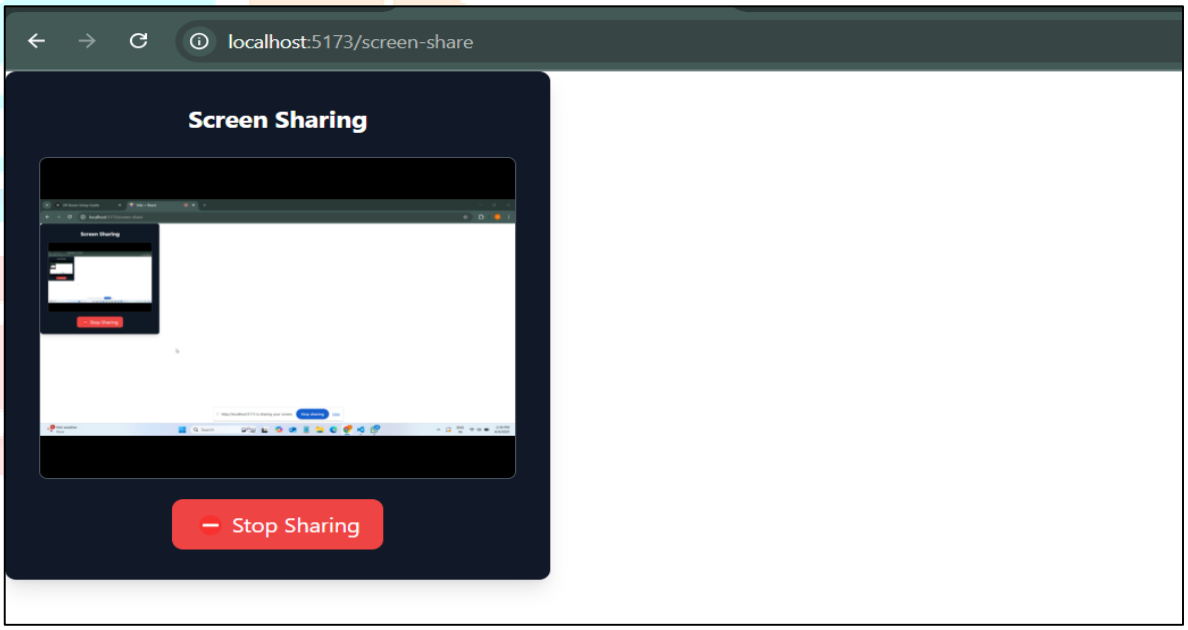


fig.11. screen share

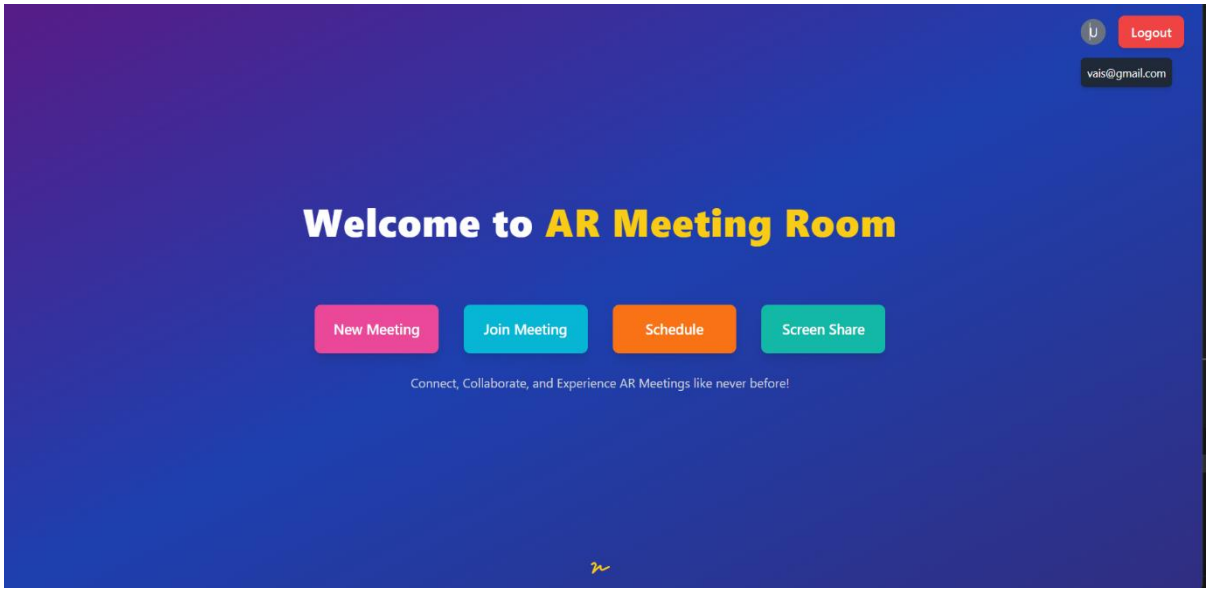


fig.12. logout page

## VI. CONCLUSION & FUTURE SCOPE

Our study highlights the potential of creating a virtual event platform using the MERN stack with AR integration to revolutionize online events. Traditional virtual event platforms often lack interactivity, making it difficult for participants to stay engaged. Our project addresses this limitation by featuring Augmented Reality (AR) to create a more realistic and dynamic event environment. Features such as real-time communication, personalized event schedules, and immersive AR elements ensure that users have a more engaging and lifelike experience.

The evolution of AR-based virtual platforms is filled with exciting possibilities, driven by advancements in technology, user experience, and industry adoption. As the Metaverse continues to evolve, integrating features such as gamification, spatial audio, and AI-driven networking can make virtual events more immersive and interactive. Augmented Reality (AR) can be enhanced with holographic presentations, interactive AR booth controls, and gestures- based controls, allowing attendees to engage with content naturally.

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