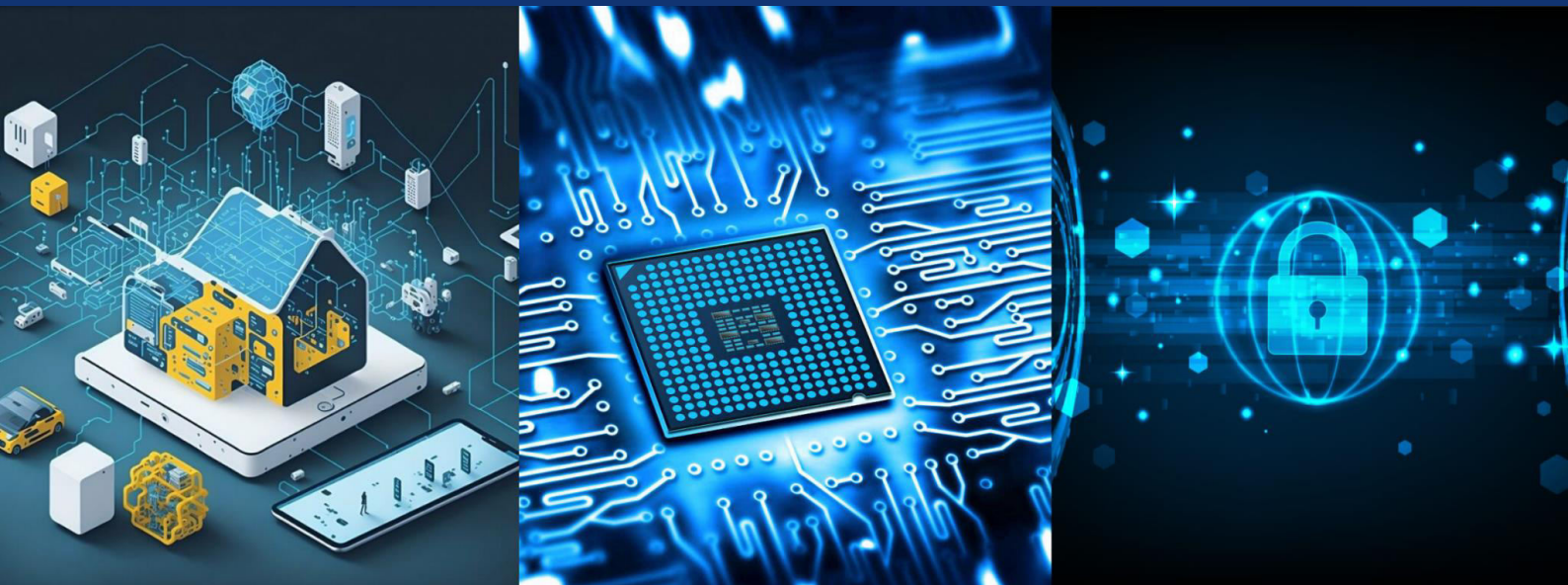
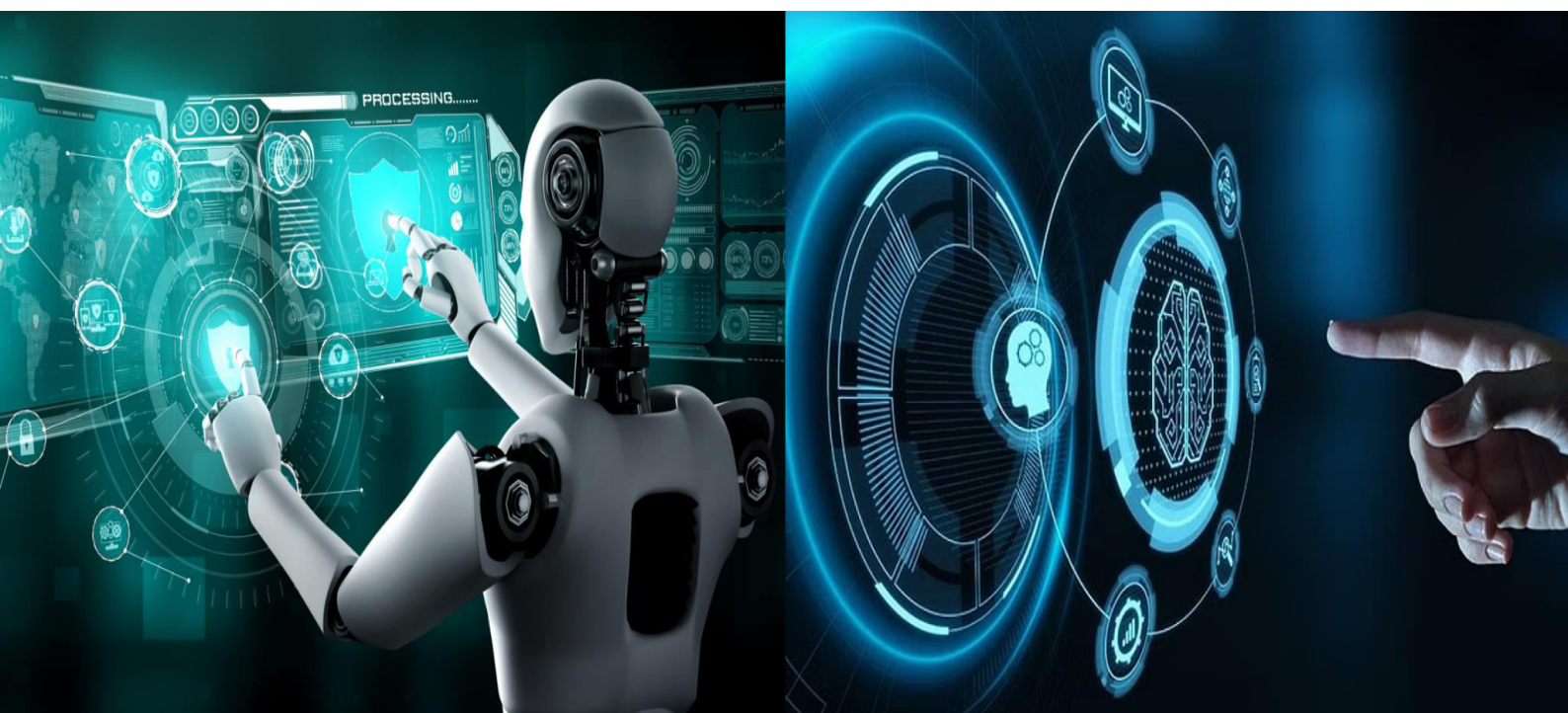




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Co-Lab: A Collaborative Project Management Tool for Remote Team

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ABSTRACT: Co-Lab is a comprehensive web application built using the MERN stack, designed to optimize project management by integrating essential team collaboration features into a single platform. Unlike conventional tools that focus on isolated functionalities, Co-Lab offers an all-in-one solution, incorporating a Kanban board, to-do lists, task assignments, GitHub synchronization, team management, real-time chat, file sharing, and video conferencing. This unified approach reduces the need to switch between multiple applications, enhancing workflow efficiency and productivity. Tailored for project-based teamwork, it enables teams to effectively organize tasks, monitor progress, communicate seamlessly, and share resources in a streamlined environment. This paper delves into the design, architecture, and implementation of Co-Lab, highlighting its role in improving collaboration for modern project teams.

KEYWORDS: Project Management, Collaboration Tool, Remote Work, Task Tracking, Real-time Communication, Workflow Automation, Cloud-based Platform, Agile Development

I. INTRODUCTION

In today's dynamic and fast-paced work environments, efficient collaboration tools are essential for effective task management, workflow organization, and seamless communication. Co-Lab is a modern, feature-rich web application developed using the MERN (MongoDB, Express.js, React, Node.js) stack, specifically designed to meet the demands of teams engaged in project-based assignments. By facilitating real-time collaboration, Co-Lab enables team members to create tasks, assign responsibilities, track project progress, and communicate efficiently within a unified platform. Unlike traditional project management tools, Co-Lab integrates multiple essential functionalities from various domains, including task management (Trello-like Kanban boards), communication tools, and version control systems. It incorporates GitHub integration, to-do lists, file sharing, and video conferencing, eliminating the need for teams to switch between multiple applications. This holistic approach to project management enhances workflow efficiency, fosters collaboration, and significantly improves overall productivity. By streamlining project coordination and fostering real-time interaction, Co-Lab serves as a comprehensive "super app" for modern project teams, bridging the gap between task execution, team communication, and version control within a single, cohesive ecosystem.

II. PROPOSED SYSTEM

To facilitate seamless team collaboration, Co-Lab integrates GitHub synchronization for version control, real-time chat for instant communication, Kanban boards for task visualization, to-do lists for task tracking, and file sharing for efficient resource management. Additionally, built-in video conferencing enables remote teams to conduct meetings without relying on third-party applications. The platform is designed with a simple and intuitive user interface, ensuring a smooth user experience that minimizes complexity and enhances productivity.

By combining these features into a unified workspace, Co-Lab aims to reduce workflow fragmentation, improve efficiency, and provide a centralized hub for project-based teamwork. The system is designed to be user-friendly, enabling



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teams to efficiently plan, track, and execute their projects while minimizing the need to switch between multiple applications.

III. CORE TECHNOLOGIES

Co-Lab is developed using the MERN (MongoDB, Express.js, React, Node.js) stack, ensuring a scalable, secure, and efficient project management experience. The choice of MERN stack allows seamless integration of key functionalities such as real-time communication, task management, authentication, and version control tracking within a single unified platform.

A. MongoDB (Database Layer)

A NoSQL database used to store structured and unstructured data, ensuring flexibility in handling tasks, user roles, chat messages, and project metadata. Supports scalable document-based storage, enabling efficient real-time updates across collaborative workspaces. Integrated with GitHub API tracking, allowing commits and project activities to be logged in a structured format.

B. Express.js (Backend Framework)

A lightweight Node.js framework that handles API requests between the frontend and database. Manages user authentication using JWT (JSON Web Tokens), ensuring secure access control. Powers real-time communication APIs for chat (React Stream Chat) and video conferencing (Agora), ensuring low-latency interactions.

C. React.js (Frontend Framework)

Provides a dynamic and interactive UI, allowing users to manage tasks through Kanban boards (React DnD Toolkit) with a smooth drag-and-drop interface. Enables real-time updates on project progress, chat messages, and video meeting availability. Optimized for a user-friendly experience, ensuring even non-technical users can navigate and use the platform efficiently.

D. Node.js (Server-Side Runtime)

Handles asynchronous data processing, ensuring smooth performance across multiple users working simultaneously. Supports GitHub integration for tracking commits and generating contribution heatmaps. Facilitates secure data transmission between users and the server, ensuring robust performance for large-scale collaboration.

IV. WORKING

A. Home Dashboard

The home section provides an intuitive interface to:

- Create a New Project: Users can initiate new projects and define key parameters.
- Browse Projects: View and join existing projects for seamless collaboration.
- Search for Projects: Efficiently locate specific projects using keyword-based search.
- Project Details: Access comprehensive project descriptions, assigned members, and progress indicators.
- Project Progress Tracking: Visual representation of task completion, including percentage-based progress tracking with categorized statuses (To-Do, In Progress, Done).

B. Project Workspace

The project workspace is the central hub for managing tasks and team activities.

1. Kanban Board

- Task Creation: Users can define new tasks with specific details.
- Status Management: Tasks are categorized as To-Do, In Progress, and Done for structured tracking.
- Drag-and-Drop Functionality: Task statuses can be updated through an intuitive drag-and-drop interface.
- Color-Coded Visualization: Tasks are visually distinguished using colors, enhancing clarity and prioritization.



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2. Task List

- Task Assignment: Assign tasks to specific team members to enhance accountability.
- Task Details: Each task includes a summary, due date, and assigned team members.
- Detailed Task View: Users can access a structured overview of all project tasks in a single interface.

3. Team Management

- Add New Team Members: Invite and manage collaborators for seamless teamwork.
- Manage Team Roles: Assign Admin and Member roles with distinct permissions.
- Bulk Invitations: Multiple team members can be added or invited for collaboration simultaneously.
- Member Removal: Admins can remove team members as needed.

4. CoMeet (Video Conferencing)

Co-Lab integrates AgoraRTC for real-time video conferencing, allowing teams to conduct:

- Virtual Meetings: Dedicated space for team discussions within the platform.
- Screen Sharing & Multi-User Calls: Enhances remote collaboration.
- Secure & Low-Latency Communication: Ensures smooth and uninterrupted video calls.

5. CoChat (Real-Time Messaging)

A full-featured messaging module powered by React Stream Chat, enabling:

- Instant Messaging: Real-time communication among team members.
- File and Image Sharing: Teams can share project-related documents and media files.
- Message Tagging & Replies: Users can tag members, reply to specific messages, and ensure structured discussions.
- Message Pinning, Editing, and Deletion: Ensures flexibility in communication management.

6. GitHub Stats & Repository Integration

Co-Lab provides seamless integration with GitHub to:

- Link GitHub Repositories: Track project-related GitHub activity within the app.
- Commit Tracking: View detailed commit history and code changes.
- Project-Specific Heatmaps: Analyze developer contributions and activity trends.

V. UML DIAGRAMS

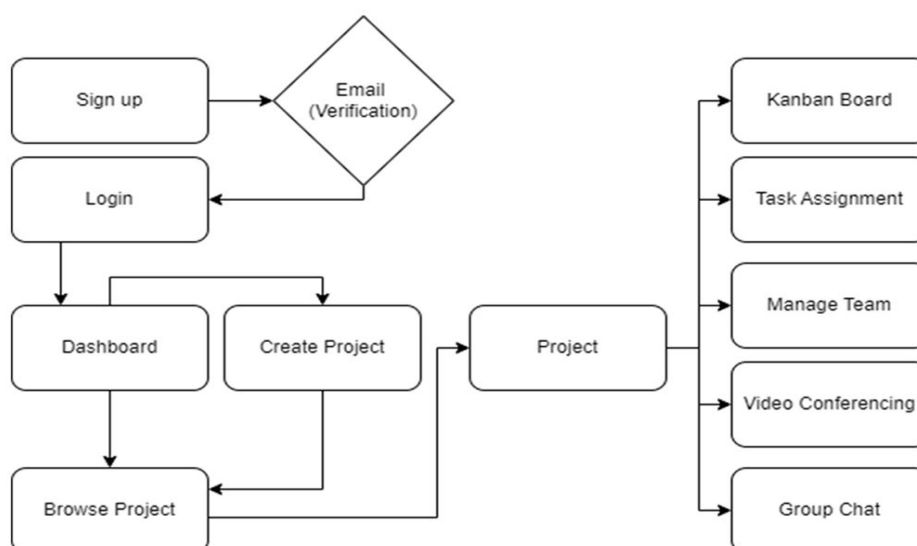


Fig 1. Flow Chart



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VI. RESULTS

[Click here to manage your first project on Co-Lab](#)

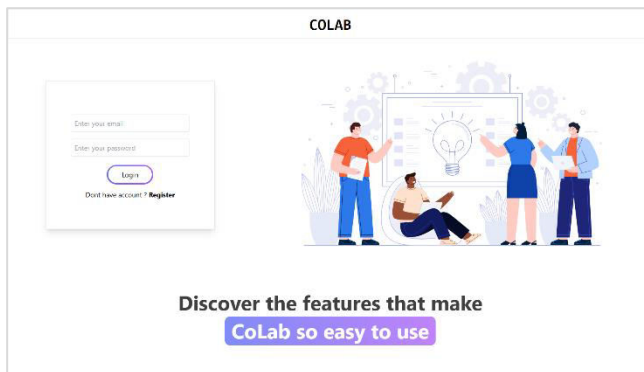


Fig 2. Landing Page

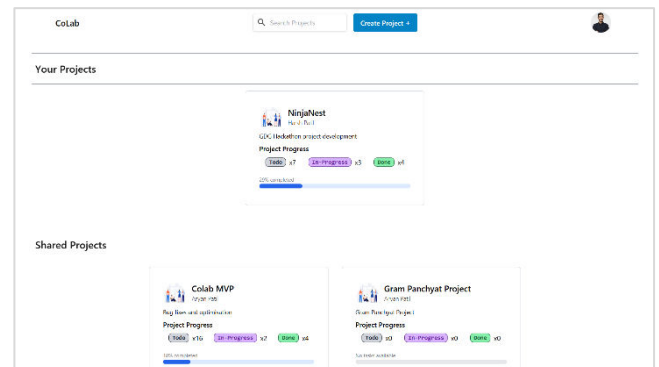


Fig 3. Home Page

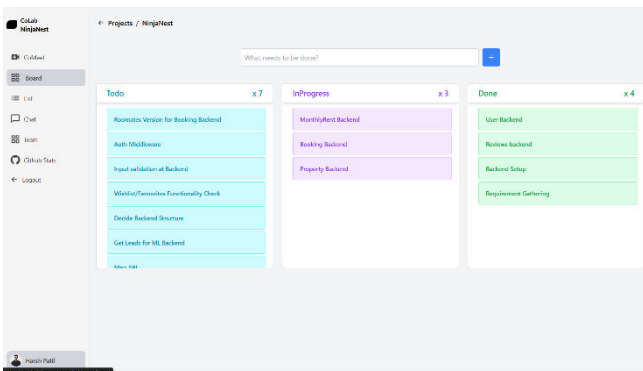


Fig 3. Kanban Board

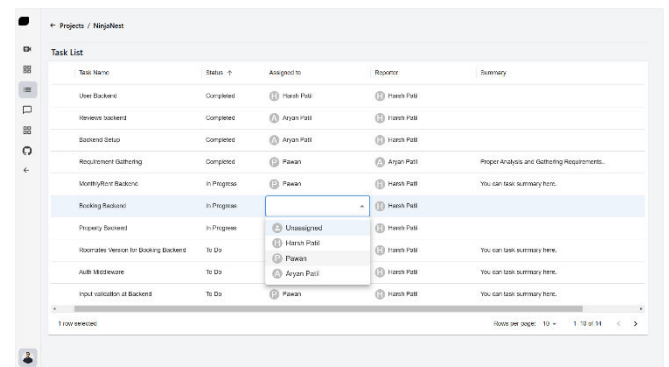


Fig 4. Task Management

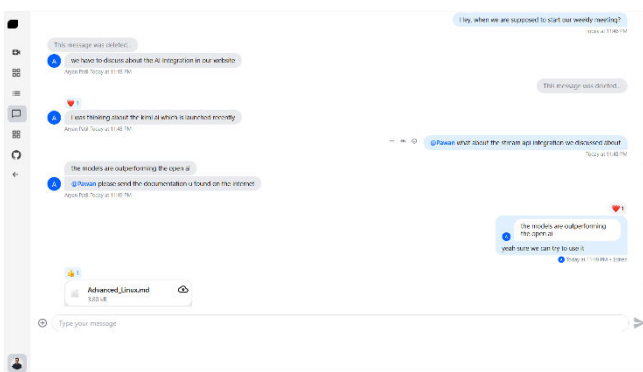


Fig 5. CoChat

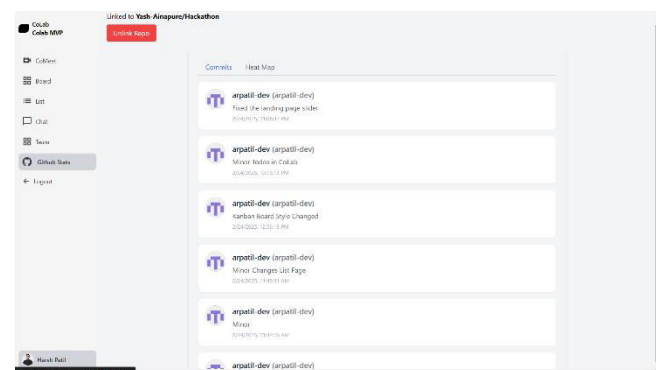


Fig 6. Github Stats



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VII. CONCLUSION AND FUTURE WORK

As proposed, we have successfully implemented Co-Lab as a comprehensive project management platform, integrating task tracking, team collaboration, real-time communication, and version control within a unified system. By leveraging the MERN stack, along with JWT authentication, AgoraRTC for video conferencing, and React Stream Chat for messaging, we have ensured a secure and efficient collaboration environment. Furthermore, our platform remains free and accessible, making it particularly beneficial for students and non-technical users. With features like Kanban boards, task lists, GitHub tracking, and seamless team management, Co-Lab provides a user-friendly and effective project management experience.

Future Enhancements:

- Moving forward, we aim to enhance Co-Lab with:
- AI-driven task automation to optimize workflows.
- Advanced analytics for deeper project insights.
- Expanded GitHub automation for better version control.
- A mobile application to enable seamless project management on the go.

With these improvements, Co-Lab will continue to evolve as an efficient, scalable, and reliable solution for modern project collaboration.

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