

A Software Engineering Project On

STUDY BUDDY

as the partial fulfillment of

Semester - VI study

for the degree of

Bachelor of Science (Information Technology)

(Affiliated to Sarvajanik University)

during the academic year 2024-2025.

Developed By:

Hunny Parmar

External Guide:

Mr. Harmish Patel

Internal Guide:

Mrs. Charmy Patel



Sarvajanik University

Shree Ramkrishna Institute of Computer Education and Applied Sciences

Behind P.T Science College, M.T.B. College Campus, Athwalines, Surat-395 001



Shree Ramkrishna Institute of Computer Education and Applied Sciences
Behind P.T. Science College, M.T.B College Campus, Athwalines, Surat-395 001.



CERTIFICATE

DEPARTMENT OF COMPUTER SCIENCE

This is to certify that
Hunny Parmar

Exam no:
SR22BSIT129

has successfully completed her software engineering project work entitled

STUDY BUDDY

as the partial fulfillment of

Semester -VI study
for the degree of

Bachelor of Science (Information Technology)

(Affiliated to Sarvajani University)
during the academic year 2024-2025.

Internal Project Guide

HOD
Dept. of Computer Science

Date : _____

Place : Surat

University Examination:

Examination No. : _____

Signature of External Examiners : _____

Internship Provisional Certificate

Private and Confidential

Date: 22-04-2025

Hunny Parmar

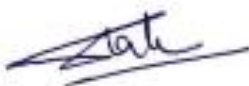
Enrollment Id: SR22BSFT129
Sarvajanik University, Surat.

To whom it may concern

This certifies that Hunny Parmar is continuing with internship training in React Js Services in our organization under our Jr. Software Developer- Harmish Patel.

The provisional date for the Internship is 11-11-2024 to 22-04-2025. Her internship activities include Learning html, CSS, JavaScript, tailwind, ReactJS, typescript, Json, and Implementation of the same in Projects.

During her internship program with us, she has been exposed to different processes and was found diligent, hardworking, and inquisitive.



Vishal Shah
HR | Operations Head



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Introduction

❖ Company Profile

Name : Toshal Infotech

Toshal Infotech Pvt. Ltd., formerly known as "Idea To Working," is a privately held IT services and consulting company based in Surat, Gujarat, India. Established in 2011, the company specializes in delivering innovative software solutions tailored to meet diverse business needs.

Mission: To convert ideas into reality by providing cutting-edge technology solutions that drive business growth and efficiency.

☐ Services Offered:

- Custom Software Development: Tailored software solutions to meet specific business requirements.
- Web Development: Design and development of responsive and user-friendly websites.
- Mobile App Development: Creation of mobile applications for various platforms.
- E-commerce Solutions: Development of online shopping platforms with integrated payment systems.
- Digital Marketing: Services including SEO, social media marketing, and email campaigns to enhance online presence.
- UI/UX Design: Designing intuitive user interfaces and experiences.
- System Integration: Integrating various software systems to work seamlessly together.

☐ Technologies and Expertise:

- Programming Languages & Frameworks: ASP.NET, Vue.js, Laravel, Node.js, and more.
- Mobile Platforms: iOS and Android development.
- CMS Platforms: DotNetNuke and custom CMS solutions.
- Databases: SQL, PostgreSQL, and MongoDB.
- Cloud Services: AWS for scalable and secure cloud solutions.
- Others: Expertise in Zendesk UI customization, HTML5, CSS, JavaScript/jQuery, and ERP development.

☐ Locations:

- Surat Office: 203, 5th Floor, SNS Interio, Althan Bhatar Road, Surat, Gujarat, 395017, India.

☐ Contact Information:

- Phone: +91 7575062161
- Email: career@toshalinfotech.com
- Website: www.toshalinfotech.com

❖ Training Activities

➤ Internship Overview(Training Work) :

As a ReactJs Intern at Toshali Infotech, I worked on developing and optimizing Web Applications by implementing scalable Front-End Solutions, contributing to enhanced performance and User Interface. I learn many languages like Html,Css,JavaScript,ReactJs and complete many tasks During Internship Learning Phase.

➤ Key Responsibilities:

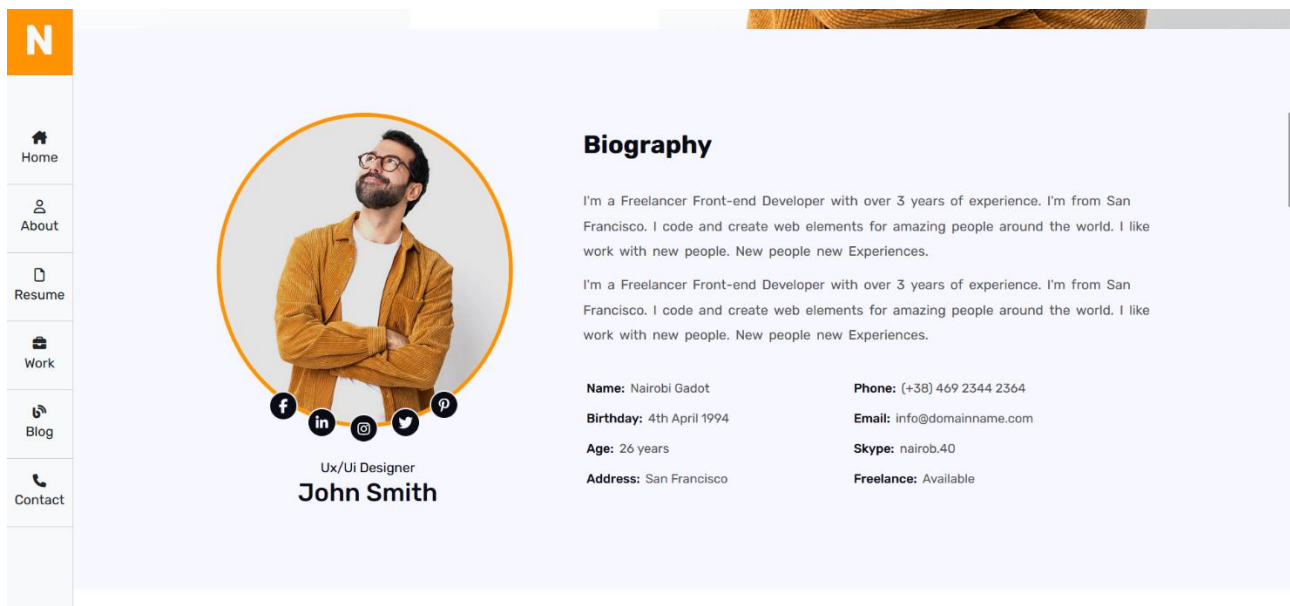
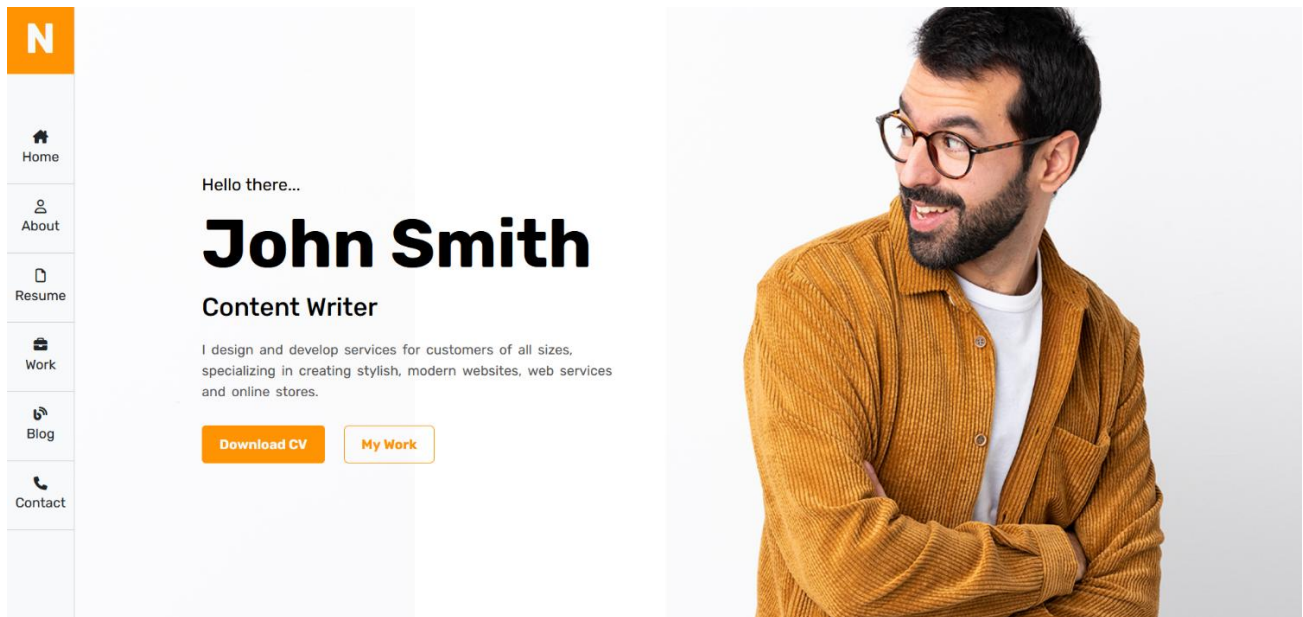
- Developed and maintained scalable front-end and components using modern web 2.1.2
Challenges Faced: technologies.
- Collaborated with cross-functional teams to design, develop, and deploy web applications.
Implemented responsive designs to enhance user experience.
- Integrated APIs and third-party services to improve application functionality.
- Participated in code reviews and contributed to improving development best practices.

➤ Challenges Faced:

- Handling Complex Debugging: Encountered issues with application performance and debugging intricate front-end requiring extensive troubleshooting and testing.
- Optimizing API Performance: Faced challenges in integrating and optimizing third-party APIs, ensuring seamless data flow and minimal latency.
- Version Control Conflicts: Managed and resolved Git merge conflicts while collaborating with development team

➤ Internship Tasks :

- Html,Css,JavaScript task : Learn Html,Css,JavaScript from Youtube tutorials and Documentation. Design Responsive demo site using Html,Css,JavaScript.



Experience.

Sr. Front-end Engineer

Google | Remote
Feb 2021 - Present

Full Time

Google LLC

Adipiscing Lorem ipsum dolor sit amet, consectetur elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor.

Visual Designer

Ridian | Remote
Mar 2020 - Present

Part Time

Ridian IT

Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Animation Artist

IBThemes | Remote
Jan 2019 - Present

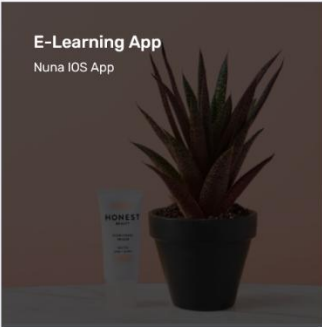
Full Time

IB Themes

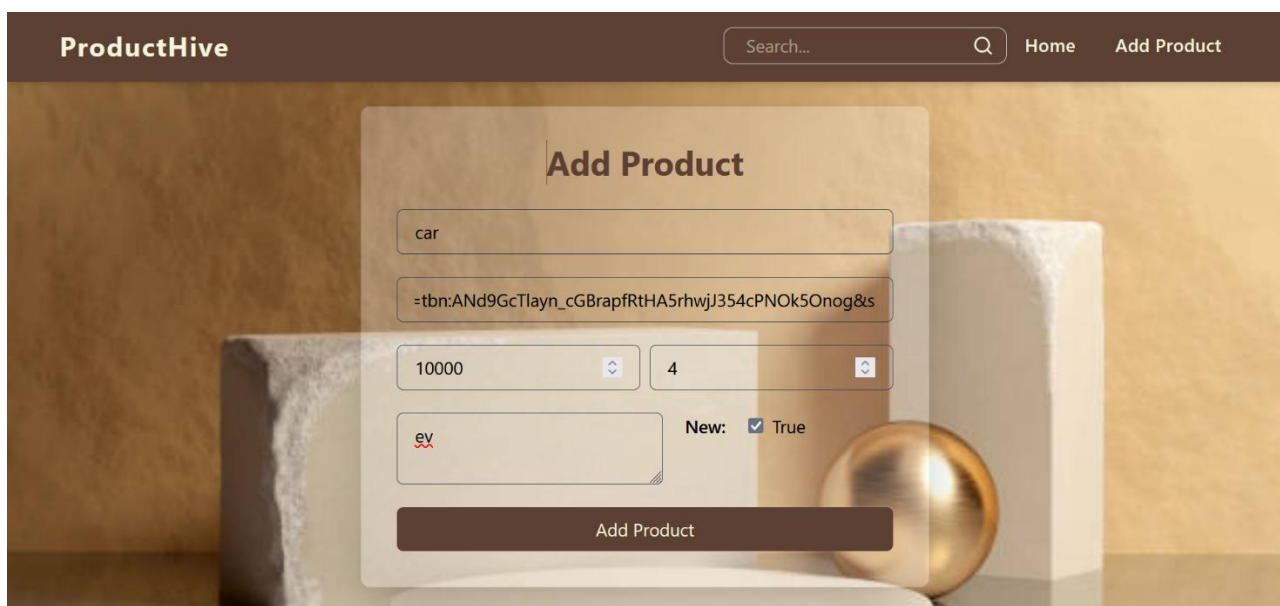
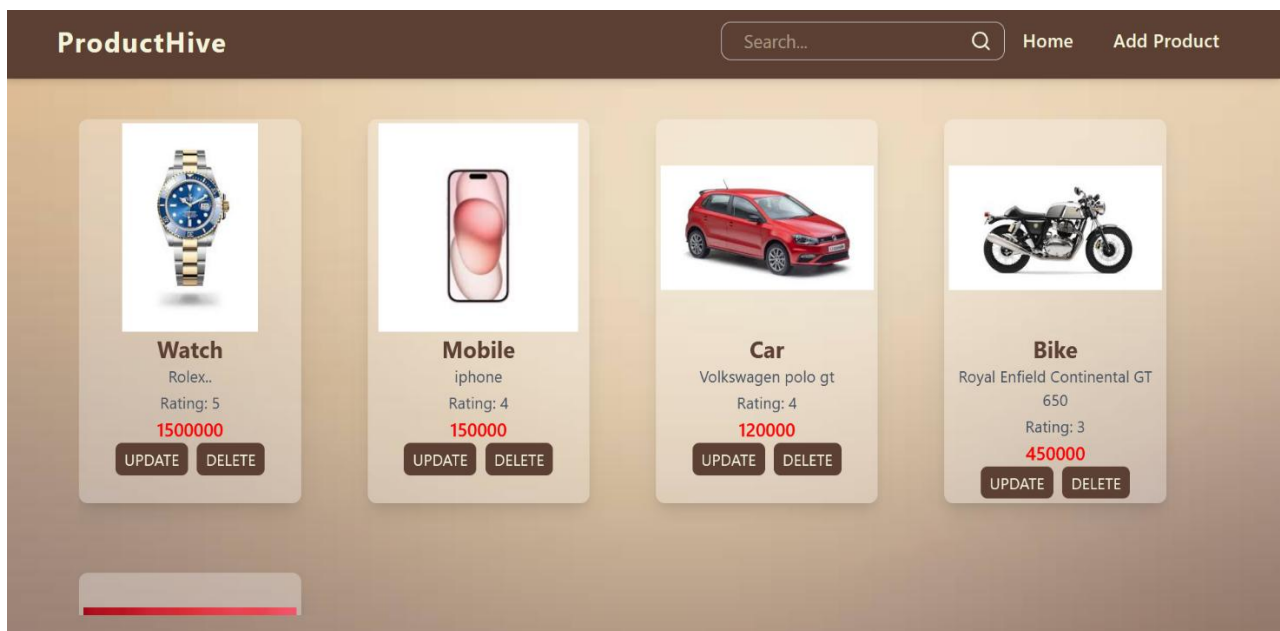
Consectetur adipiscing elit,lorem ipsum dolor sit amet, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor.

My Portfolio.

All Branding Photography Fashion Product



- ReactJs task : Learn ReactJs from Youtube tutorials and Documentation. CRUD operation with dummy api of products using ReactJs. Use redux store for state management. And also used tailwind CSS for UI.



Edit Product

shoes

<https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9Gc>

10000

4

white color

New: ☒ True

Update Product



Project Profile

Project Title :	Study Buddy
Objective :	The objective of StudyBuddy – Your Academic Companion is to develop a smart, student-focused platform that enhances collaborative learning. The project aims to help students connect with suitable study partners, manage notes using flashcards, generate quizzes from study material, and communicate in real-time—all through a secure and user-friendly interface. It combines AI, chat systems, and productivity tools to support students in achieving academic success.
Frontend Tool :	React JS
Backend Tool :	Node JS
Database :	MongoDB
Tools & Technologies used:	Frontend: React.js, Tailwind CSS, Axios Backend: Node.js, Express.js Database: MongoDB, Mongoose Authentication & Security: JWT, bcryptjs, Helmet, CORS AI Integration: Gemini API (for quiz generation) Real-Time Chat: Socket.io Utilities & Testing: Postman, dotenv Deployment & Version Control: GitHub, Render/Vercel

Duration :	3 months & Ongoing
Team Members:	Hunny Parmar Dhruvi Mehta Stuti Shah Princy Shah

System Introduction

❖ Definition

StudyBuddy – Your Academic Companion is a comprehensive, web-based academic support platform designed specifically for students to improve their learning, revision, and collaboration experience. It serves as a centralized workspace where students can plan their academic tasks, prepare effectively using AI-powered tools, and engage with peers in real time.

The platform offers multiple integrated features:

- To-Do List to manage tasks and study plans
- Flashcards for quick revision and memory enhancement
- AI-Powered Quiz Generator that creates quizzes from uploaded PDFs or user-written notes using the Gemini API
- Smart Match System that pairs students with similar academic interests
- Real-Time Chat and Audio Calling features using Socket.io and WebRTC
- Leaderboard and Progress Tracking for gamified learning and performance monitoring
- StudyBuddy aims to create a collaborative and self-paced study environment, catering to both individual learners and study groups.

❖ Objective

- The primary objectives of the StudyBuddy platform are outlined below, focusing on both individual learning enhancement and collaborative academic engagement:
- To provide a centralized digital academic workspace where students can organize and manage their learning resources and tasks efficiently.
- To enable AI-powered quiz generation by allowing students to upload PDFs or notes, from which relevant questions and multiple-choice answers are auto-generated for practice and self-assessment.

- To offer real-time communication tools such as messaging and audio calls, helping students collaborate, discuss doubts, or engage in group study sessions.
- To track academic progress and engagement, offering insights into user activity, completed quizzes, and ranking students through a leaderboard to boost motivation.
- To implement a smart matching algorithm that connects students with similar subjects, goals, or learning styles, encouraging collaborative peer-to-peer learning

❖ Scope

The StudyBuddy system is designed with the following functionalities and user flows in mind:

User Authentication:

Students can register and securely log in using email and password.

Token-based authentication ensures data privacy and route protection.

Core Modules:

- **Quiz Module:** AI-generated quizzes from uploaded PDFs or manually entered notes.
- **Flashcard Module:** Create and manage digital flashcards for active recall.
- **To-Do Module:** Create, edit, and track study-related tasks.
- **Chat & Audio Call Module:** Real-time messaging with typing indicators and voice calling for enhanced collaboration.

AI Integration:

- Uses Gemini API to process user-uploaded content and generate relevant quiz questions.

- Quiz formats include MCQs, fill-in-the-blanks, and true/false.

Real-Time Communication:

- Uses Socket.io for live chat and WebRTC (via simple-peer) for peer-to-peer audio calls.
- Allows students to interact instantly, making learning more engaging.

Leaderboard & Performance Analytics:

- Tracks completed tasks, quiz scores, and activity levels.
- Displays a leaderboard to foster healthy academic competition among users.
- StudyBuddy is scalable and modular, with potential for mobile support and advanced analytics in future versions.

❖ Modules/Functionality Description

1. Registration

Allows users to create an account by providing personal, educational, and academic goal details.

Field Name	Data Type	Required	Default	Description
ProfilePicture	String	No	null	Stores the URL or path of the user's profile image.
FullName	String	Yes	—	Full name of the user.
UserName	String	Yes	—	Unique username used for identification and chat features.
Email	String	Yes	—	User's email address. Must be unique and valid (validated using validator).
Password	String	Yes	—	User's password (stored securely after hashing).
Country	String	Yes	—	The country where the user resides.
State	String	Yes	—	The state or region of the user.
EducationLevel	String	Yes	—	Represents the user's academic standing (e.g.,

				High School, BSc, MSc, etc.).
Subject	String	Yes	—	Primary subject the user is focused on or interested in.
StudyGoals	String	Yes	—	User's academic goals or areas of focus (e.g., exam prep, concept mastery).
createdAt	Date	Auto	—	Automatically managed timestamp when the record is created.
updatedAt	Date	Auto	—	Automatically managed timestamp when the record is last updated.

2. Login

Enables secure login using email and password. Includes OTP-based forgot password feature for account recovery.

3. To-Do List

Lets users manage academic tasks categorized by status (Backlog, ToDo, In Progress, Completed). Supports drag-and-drop feature for status updates.

Column Name	Data Type	Description
id	string	Unique task identifier
title	string	Title of the task
description	string	Description of the task
dueDate	date	Task due date
status	enum	Task status (Backlog, ToDo, etc.)
userId	string	User identifier

4. Flashcards

Users can create flashcards manually or from uploaded notes. Flashcards can be viewed, filtered, and searched.

Column Name	Data Type	Description
id	string	Unique flashcard identifier
question	string	Flashcard question
answer	string	Flashcard answer
userId	string	User identifier

5. Quiz

Users upload notes or PDFs; Gemini API generates quizzes. Includes scoring, answer tracking, and submission history.

Column Name	Data Type	Description
id	string	Unique quiz identifier
title	string	Title of the quiz
questions	array	List of questions and options
answers	array	List of correct answers
userId	string	User identifier

6. Live Chat

Real-time messaging system with support for text and image sharing. Online user tracking and audio calls enabled via WebRTC and Socket.io.

Column Name	Data Type	Description
id	string	Unique message identifier
senderId	string	Sender's user identifier
receiverId	string	Receiver's user identifier
content	string	The content of the message
timestamp	date	Timestamp of the message

7. Progress Tracking

Tracks user engagement such as number of quizzes taken, flashcards reviewed, and displays this on dashboard.

Derived from Quiz and Flashcard usage logs

8. Leaderboard

Ranks users weekly based on their performance (quiz scores, flashcard activity, etc.). Displays top 10 students.

Aggregated from Quiz and Progress Tracking statistics

9. Profile Page

Users can view and edit their personal info, educational background, and study preferences.

Editable fields: FullName, Email, Country, State, EducationLevel, Subject, StudyGoals, ProfilePicture

10. Logout

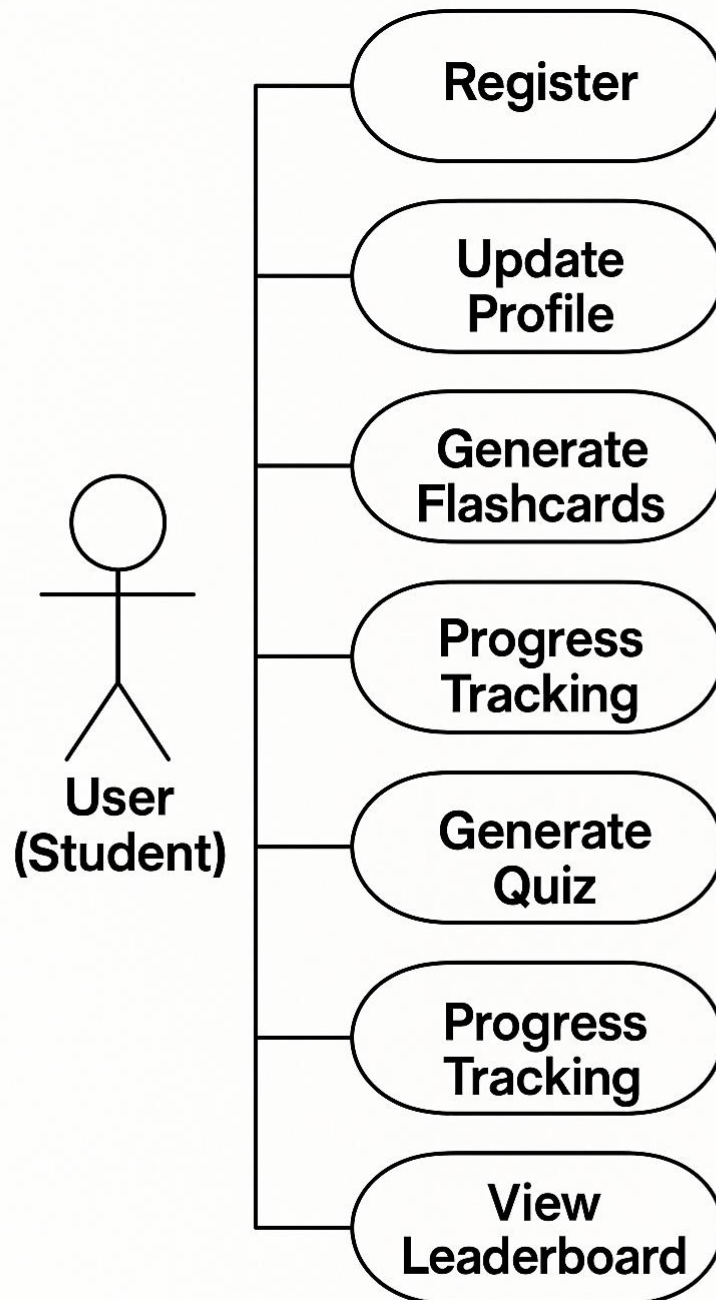
Securely logs out the current user. Accessible from the profile picture dropdown in the navigation bar.

Session/token removal handled in frontend/backend middleware

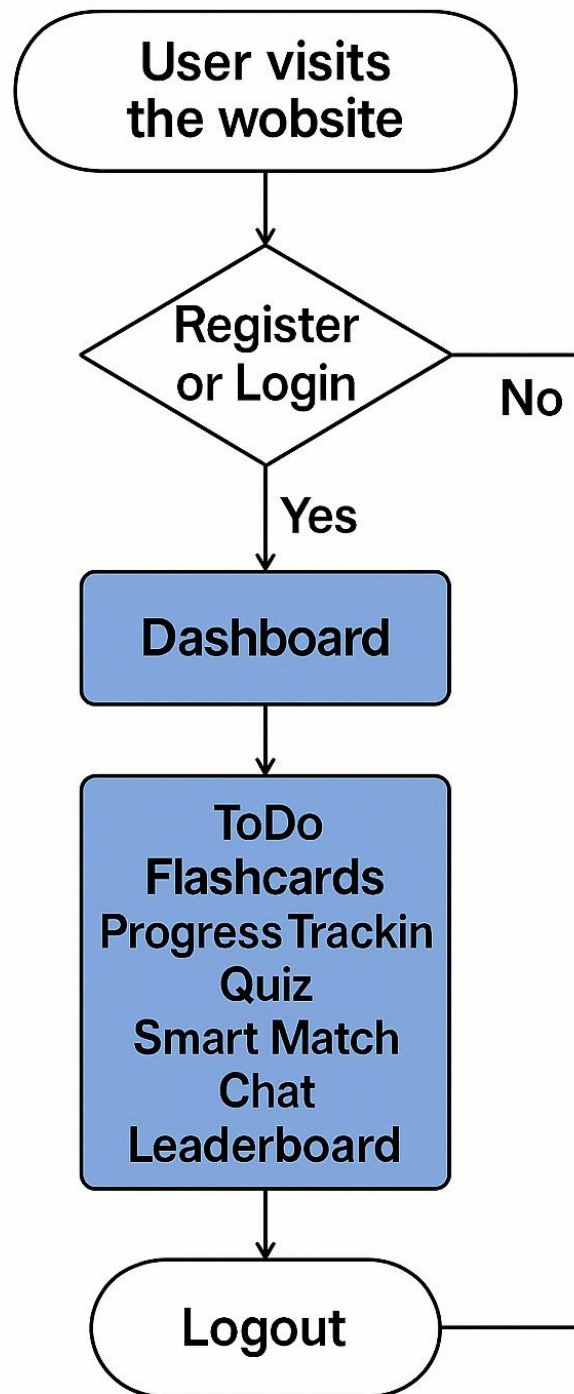
Requirement Analysis & Modelling

❖ Use Case Diagram

User (Student) Use Cases:

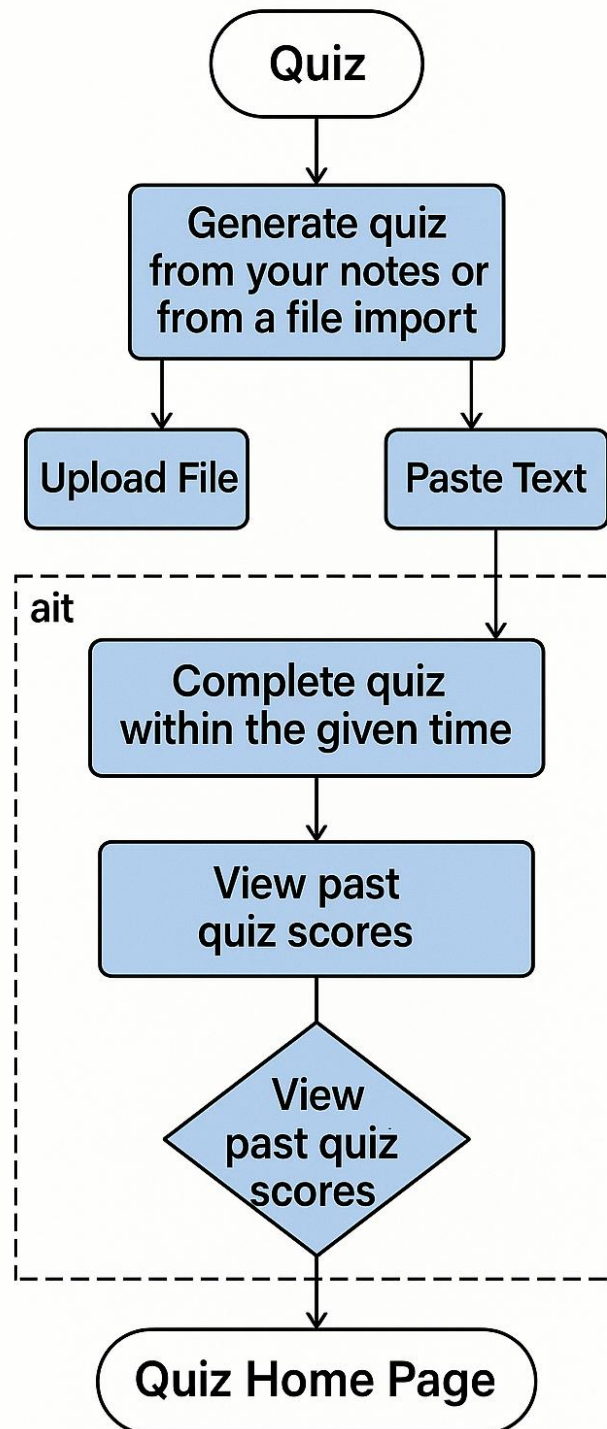


❖ Activity Diagram (User Flow)

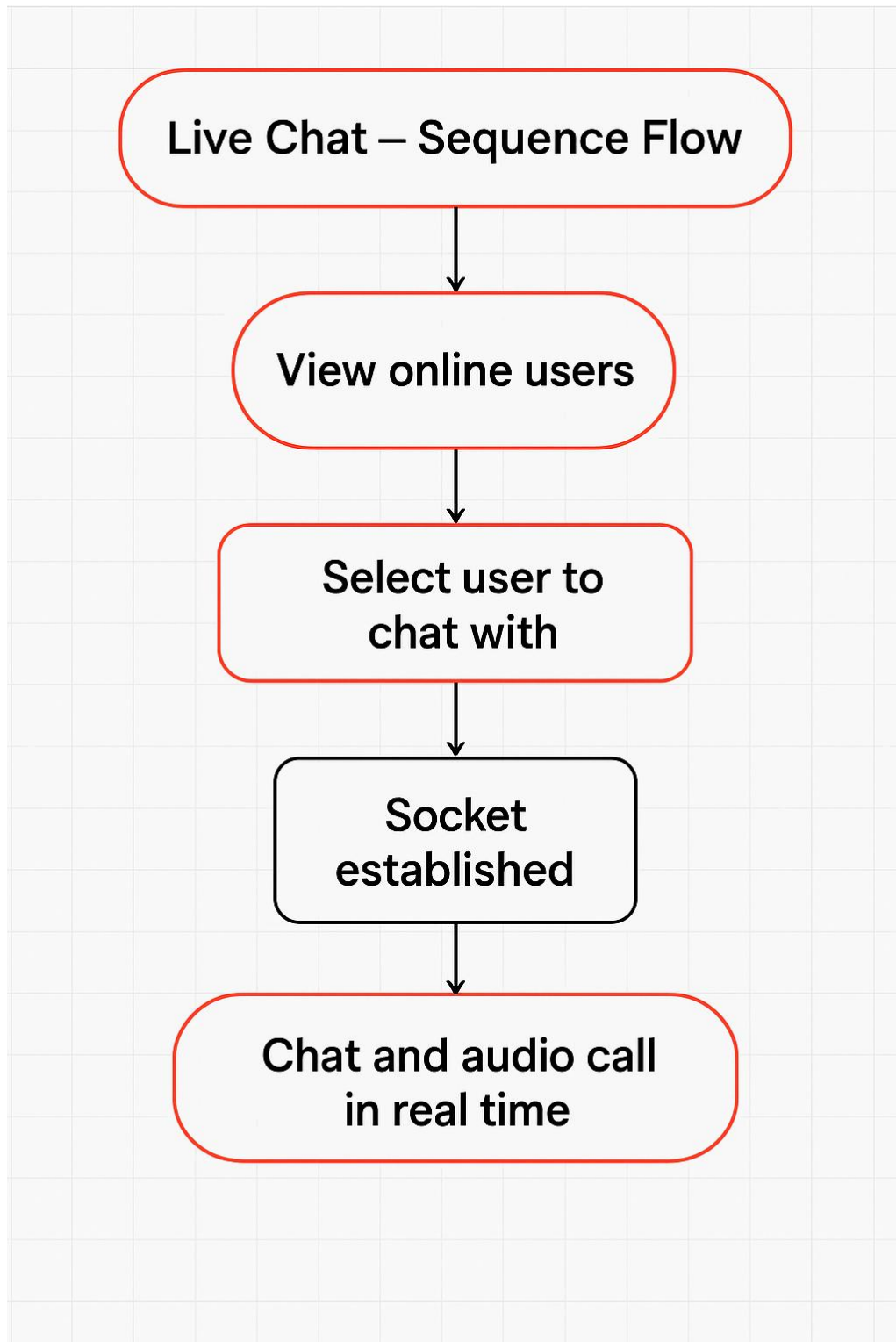


❖ Sequence Diagram

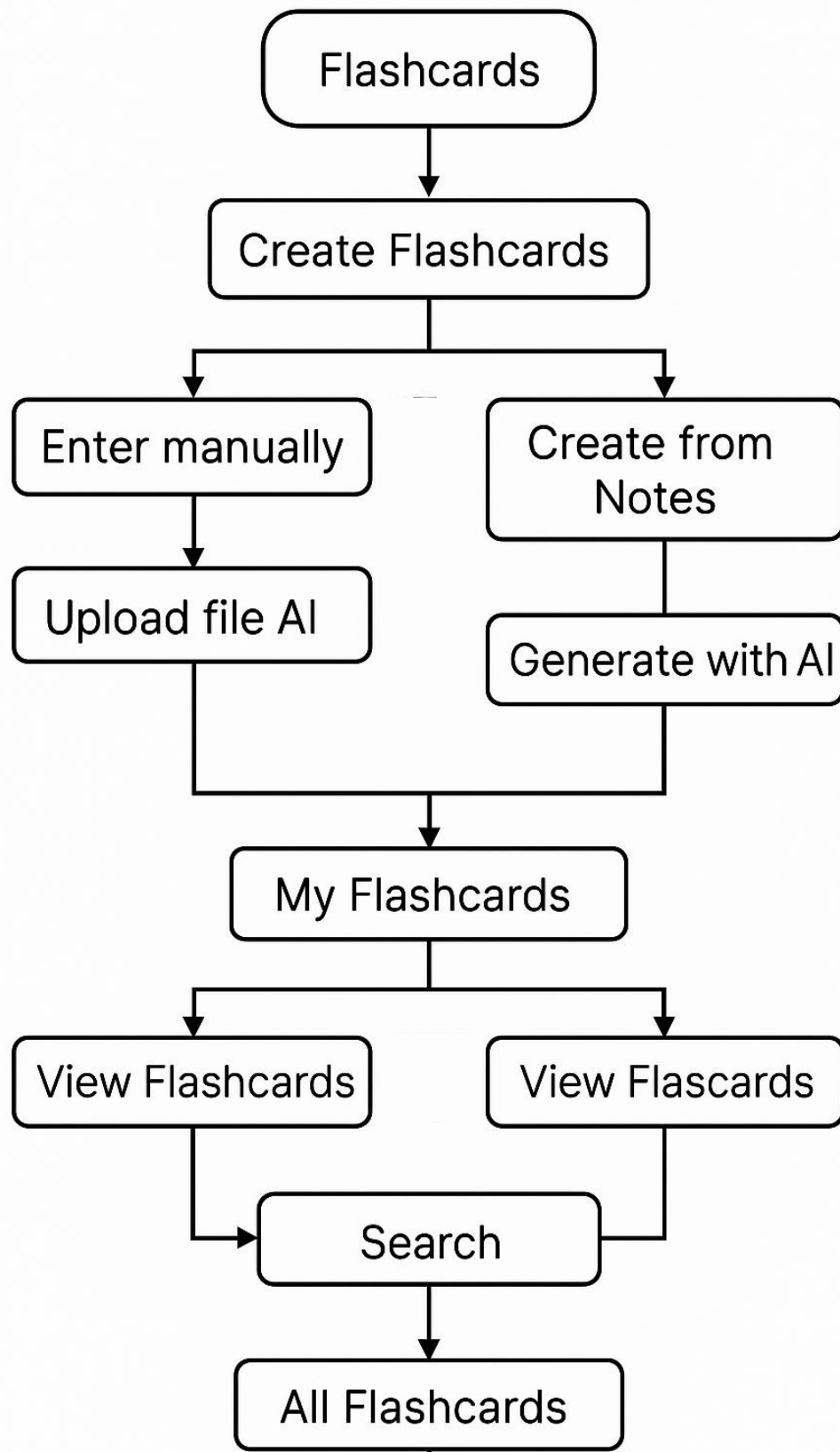
Quiz Feature :-



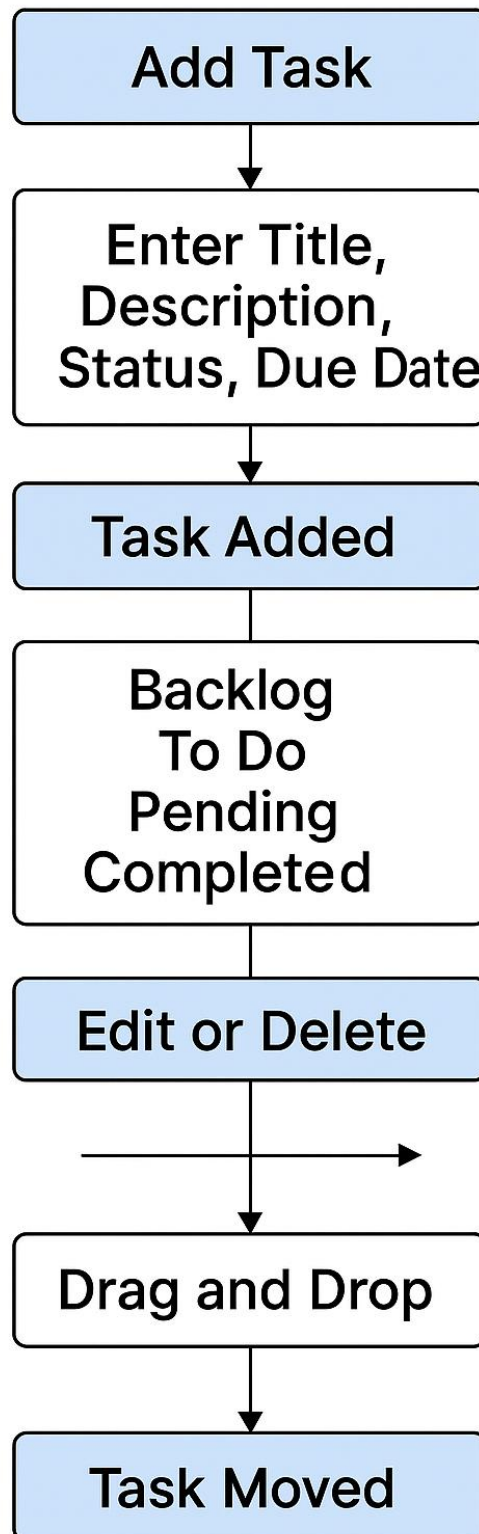
Live Chat Feature :-



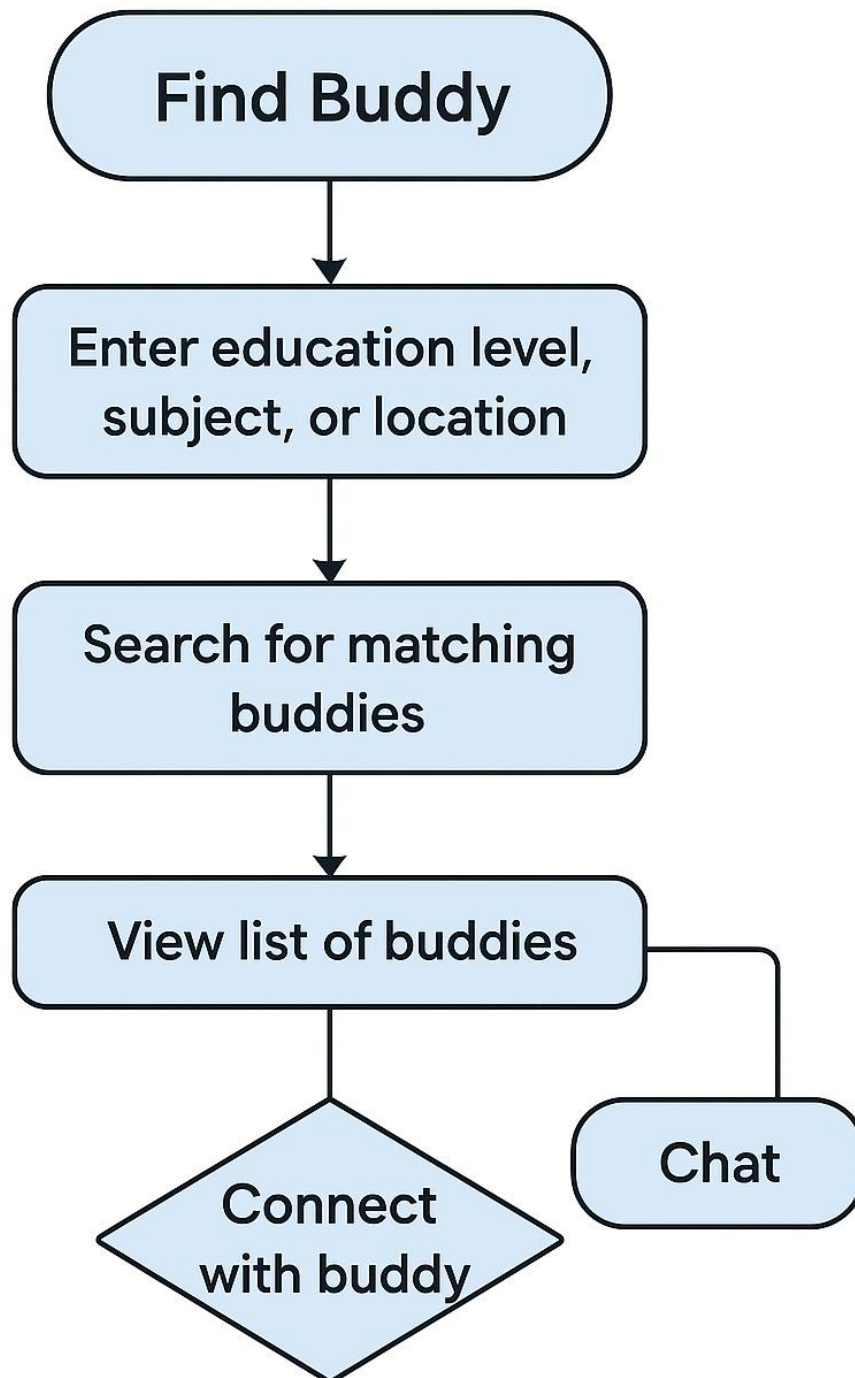
Flashcard Feature :-



ToDo List Feature :-



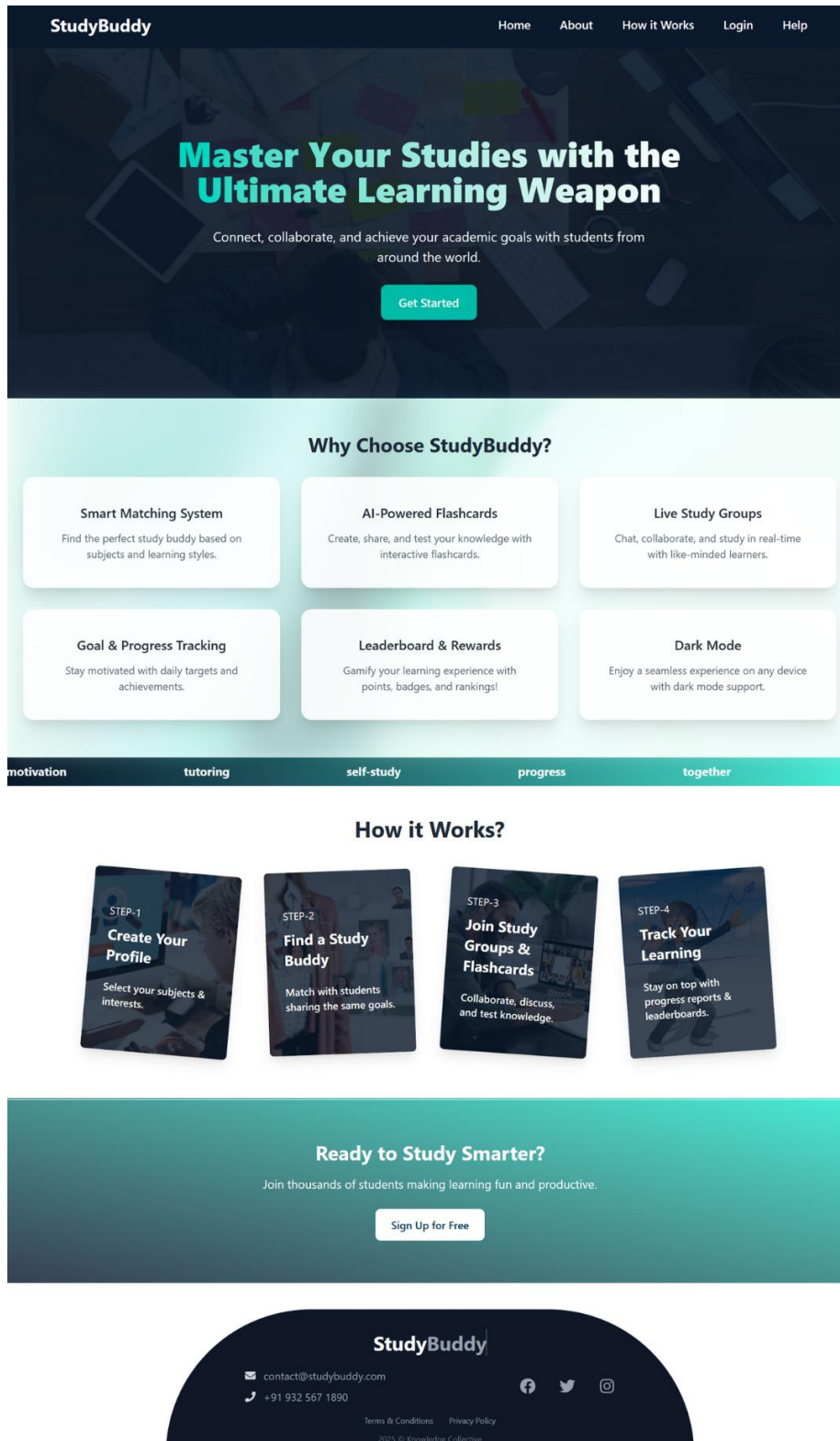
Smart Matching :-



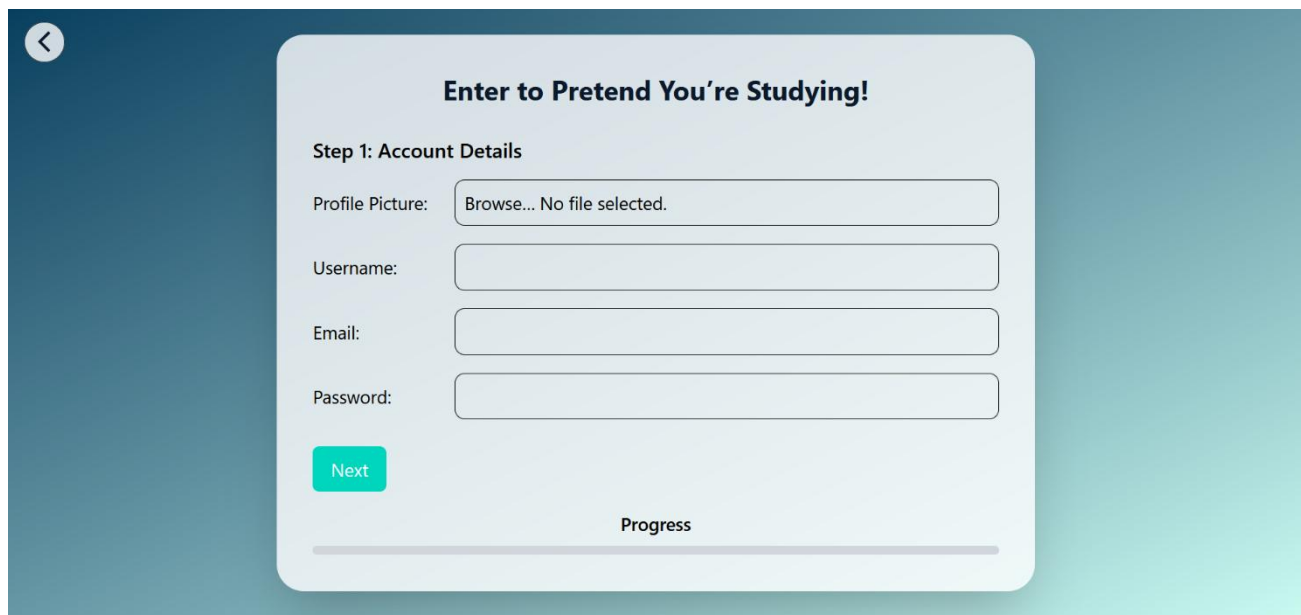
System Design

❖ Interface design

Landing Page :-



Signup Page :-



A screenshot of a signup page with a dark blue gradient background. A white card in the center contains the title "Enter to Pretend You're Studying!". Below the title is "Step 1: Account Details". The form includes fields for "Profile Picture" (with a "Browse... No file selected." placeholder), "Username", "Email", and "Password". A teal "Next" button is at the bottom left of the form. Below the form is a "Progress" indicator with a horizontal line.

Enter to Pretend You're Studying!

Step 1: Account Details

Profile Picture:

Username:

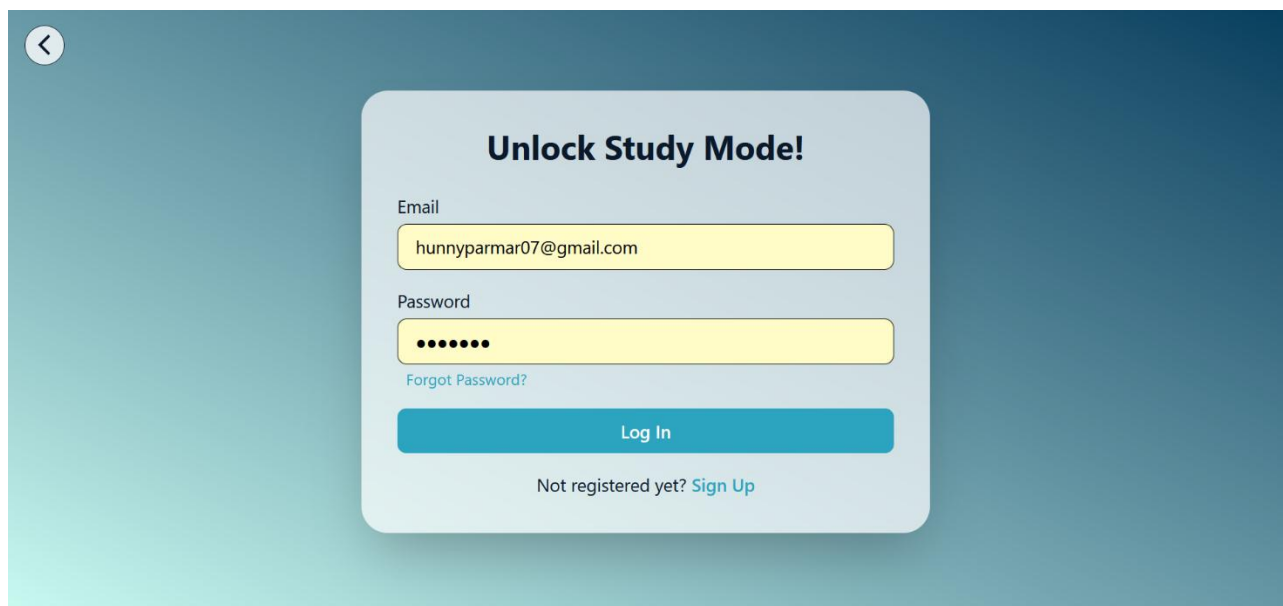
Email:

Password:

[Next](#)

Progress

Login Page :-



A screenshot of a login page with a dark blue gradient background. A white card in the center contains the title "Unlock Study Mode!". Below the title are fields for "Email" (containing "hunnyparmar07@gmail.com") and "Password" (masked with dots). A teal "Log In" button is below the password field. A link "Forgot Password?" is to the left of the button. At the bottom, it says "Not registered yet? [Sign Up](#)".

Unlock Study Mode!

Email

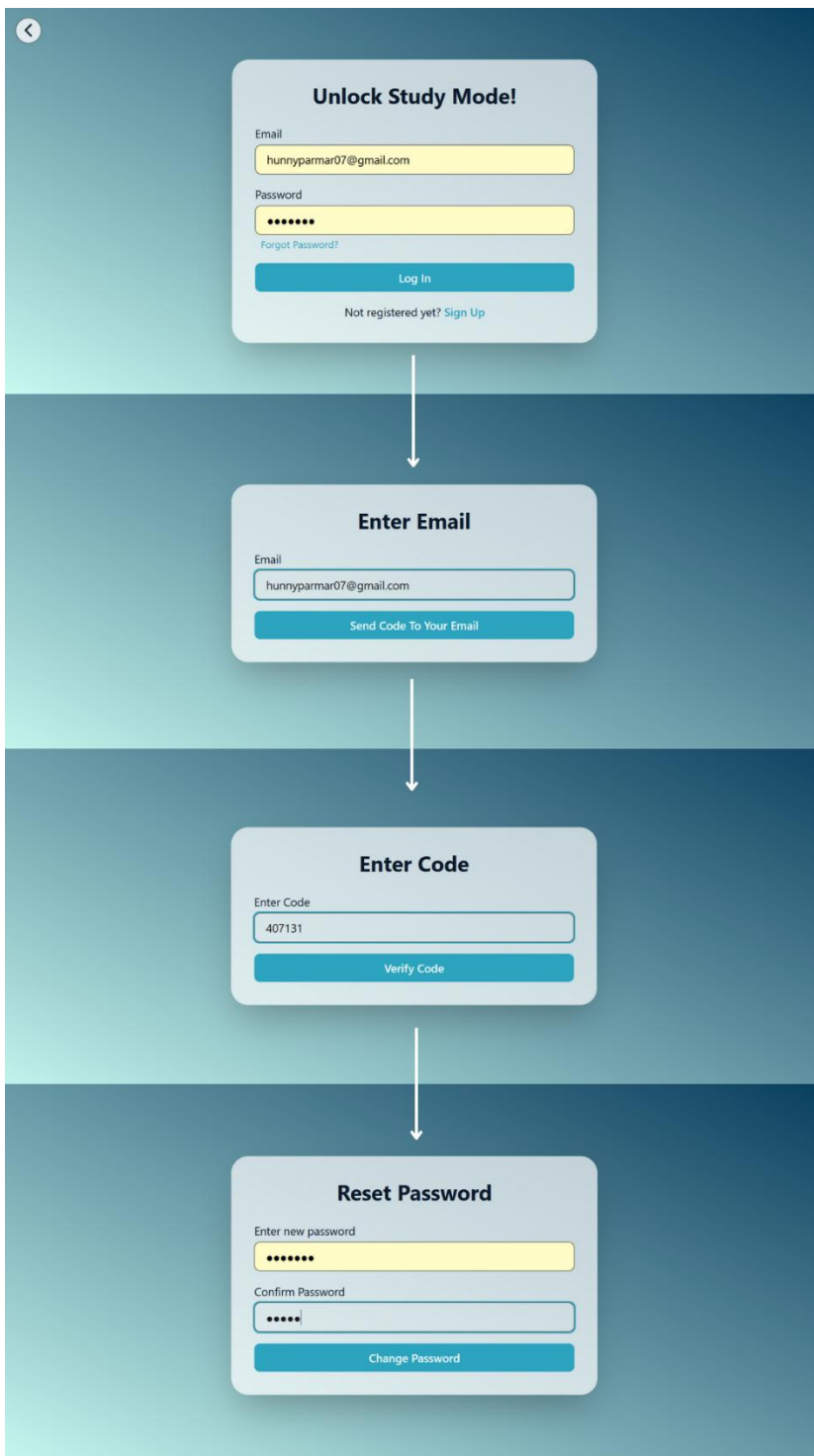
Password

[Forgot Password?](#)

[Log In](#)








Not registered yet? [Sign Up](#)

Forgot Password :-




Profile :-

StudyBuddy


-  Home
-  To-Do List
-  FlashCard
-  Find Buddy
-  Quiz
-  Notifications
-  Leader Board

hunny2004




[Change Picture](#)
Hunny Parmar
hunnyparmar07@gmail.com
Country: AU

Account Settings



User Information ▾
User Information
Location
Study Preferences

Save Changes

Todo List Page :-

StudyBuddy

Home

To-Do List

FlashCard

Find Buddy

Quiz

Notifications

Leader Board

hunny2004

Task Management

Title

Due Date

Status

Task Title

dd / mm / yyyy

Backlog

Description

Task Description (optional)

Clear

Add Task

Backlog

ToDo

InProgress

Completed

Todo

change the ui

Due: 2025-04-15

Find Buddy Page :-

StudyBuddy

Home

To-Do List

FlashCard

Find Buddy

Quiz

Notifications

Leader Board

hunny2004

Find Study Buddy

Education Level

Subject

Select Country

S

Stuti Udaybhai Shah

@stuti_shah__

Education: 12th complete

Subject: science

Country: IN

D

Dhruvi Mehta

@dhruvi

Education: 12th pass

Subject: node.js

Country: IN

K

Khushi Mehta

@khushi

Education: 12th pass

Subject: node.js

Country: IN

S

S

@s

Education: bscit

Subject: "node"

B

BHAVESH TELI

@Bhaves

Education: Graduation

Subject: Computer Science

P

Princy Shah

@princy

Education: 12th pass

Subject: node.js

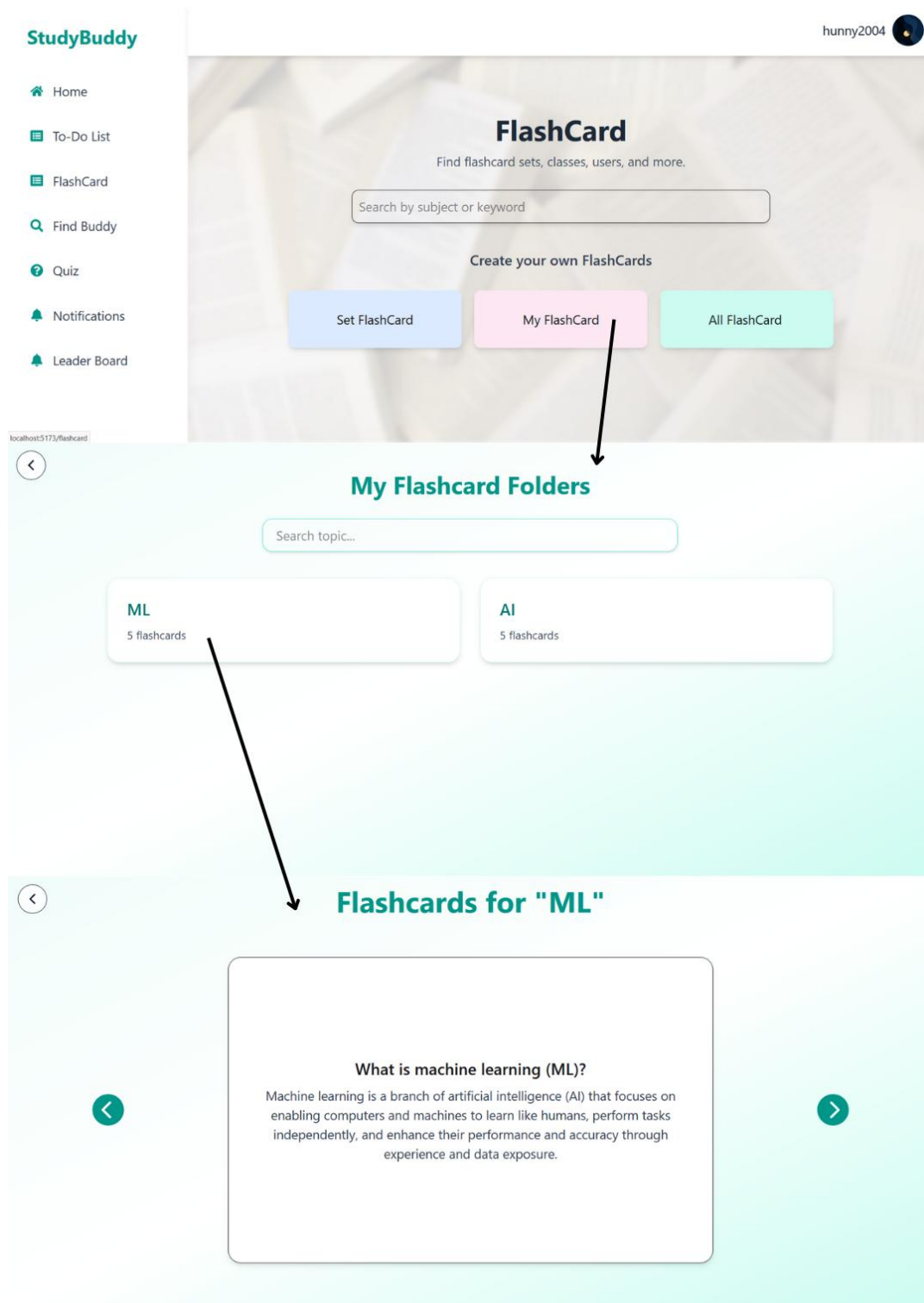
FlashCard :-

Set FlashCard :-

The diagram illustrates the workflow for setting a flashcard on the StudyBuddy platform:

- StudyBuddy Home Page:** The 'Set FlashCard' button is highlighted in the main navigation area.
- FlashCard Modal:** A modal titled 'How do you want to create your flashcard?' appears, offering two options: 'Generate from an upload' and 'Create them yourself'.
- Generation Screens:** The process branches into two specific screens:
 - GENERATE FLASHCARD SET:** A screen for generating a set from text or files, featuring a text input area and a 'Generate' button.
 - CREATE A NEW FLASHCARD SET:** A screen for creating a new set, with fields for 'Enter a topic', 'Add notes...', and individual term/definition pairs, along with an 'Image' upload option.

My FlashCard :-



All FlashCards :-

The image shows a two-part screenshot of the StudyBuddy application. The top part is the main FlashCard interface, and the bottom part is a detailed view of a specific flashcard set.

Top Screenshot: FlashCard Interface

- Header:** StudyBuddy logo on the left, user 'hunny2004' on the right.
- Left Sidebar:** Home, To-Do List, FlashCard, Find Buddy, Quiz, Notifications, Leader Board.
- Main Content:**
 - FlashCard** title with subtitle 'Find flashcard sets, classes, users, and more.'
 - Search bar: 'Search by subject or keyword'
 - Create your own FlashCards** section with three buttons: 'Set FlashCard' (blue), 'My FlashCard' (pink), and 'All FlashCard' (teal).

An arrow points from the 'All FlashCard' button to the bottom screenshot.

Bottom Screenshot: All Flashcard Folders

- Header:** 'All Flashcard Folders' title, back button, search bar 'Search topic...'
- Folders:**
 - AI**: 10 flashcards
 - ML**: 5 flashcards
 - Node.js**: 5 flashcards (highlighted with an arrow)
 - React.js**: 5 flashcards

An arrow points from the 'Node.js' folder to the next screenshot.

Next Screenshot: Flashcards for "Node.js"

- Header:** 'Flashcards for "Node.js"' title, back button.
- Flashcard Content:**
 - What is Node.js?**
 - Node.js is a JavaScript runtime environment that allows developers to run JavaScript on the server side.
- Navigation:** Left and right arrow buttons for navigating between flashcards.

Quiz :-

Upload Files :-

StudyBuddy

hunny2004

Home

To-Do List

FlashCard

Find Buddy

Quiz

Notifications

Leader Board

Generate a Practice Test

Choose or upload materials to generate practice questions designed for you

Upload files Paste texts View Past Quizzes

Drag and drop notes, readings, lecture slides, etc.

Supported file types are .docx, .pdf, .pptx

Browse files

Generate

Quiz

Time Left: 29:55

1. What type of library is Framer Motion?

A game development library

A data visualization library

A state management library

A declarative animation library

2. What language is Framer Motion specifically designed for use with?

React

Java

Python

JavaScript

3. What company developed Framer Motion?

Microsoft

Facebook

Google

Framer

Submit

GSAP React Spring

Anime.js JQuery Animate

Correct Answer: React Spring

19. Which library is generally preferred for complex animation sequencing and timelines?

GSAP

React Spring

Correct Answer: GSAP

20. What is a primary benefit of using Variants in Framer Motion?

Smaller bundle size

Reusability of animation states

Improved performance

Simplified event handling


Correct Answer: Reusability of animation states


Score: 4 / 20


Time Taken: 31s


Paste texts :-


StudyBuddy


User 


 Home


 To-Do List

 FlashCard

 Find Buddy

 Quiz

 Notifications

 Leader Board

Generate a Practice Test

Choose or upload materials to generate practice questions designed for you

Upload files **Paste texts** View Past Quizzes


Paste Your Notes


Paste text here


Generate


View Past Quizzes :-


StudyBuddy


hunny2004 


 Home


 To-Do List

 FlashCard

 Find Buddy

 Quiz




 Notifications

 Leader Board

Generate a Practice Test

Choose or upload materials to generate practice questions designed for you

Upload files Paste texts **View Past Quizzes**




Drag and drop notes, readings, lecture slides, etc.

Supported file types are .docx, .pdf, .pptx

Browse files

Generate

Your Quiz History

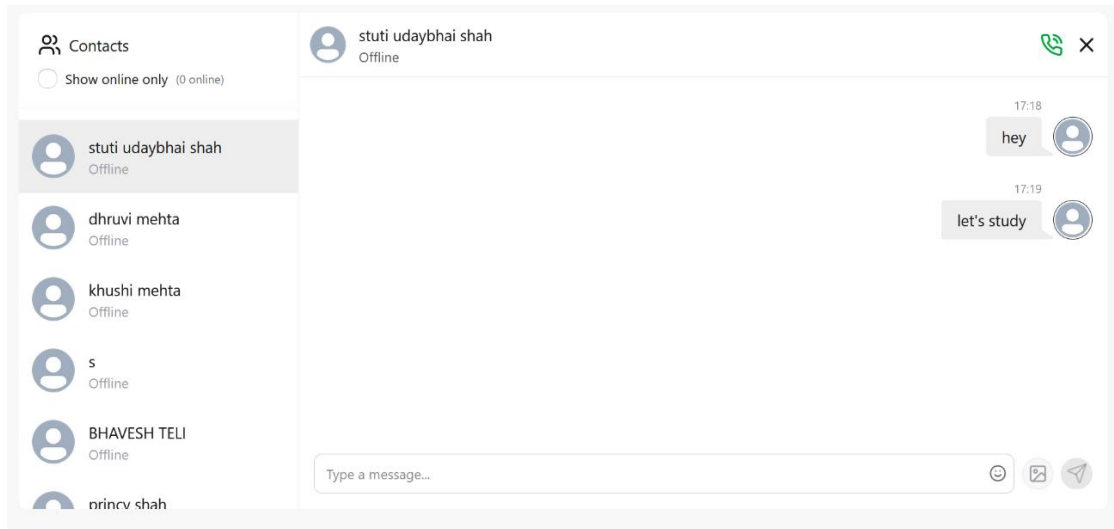
 **Total Score: 4 / 20**
Each correct answer earns 1 point.

Quiz 1

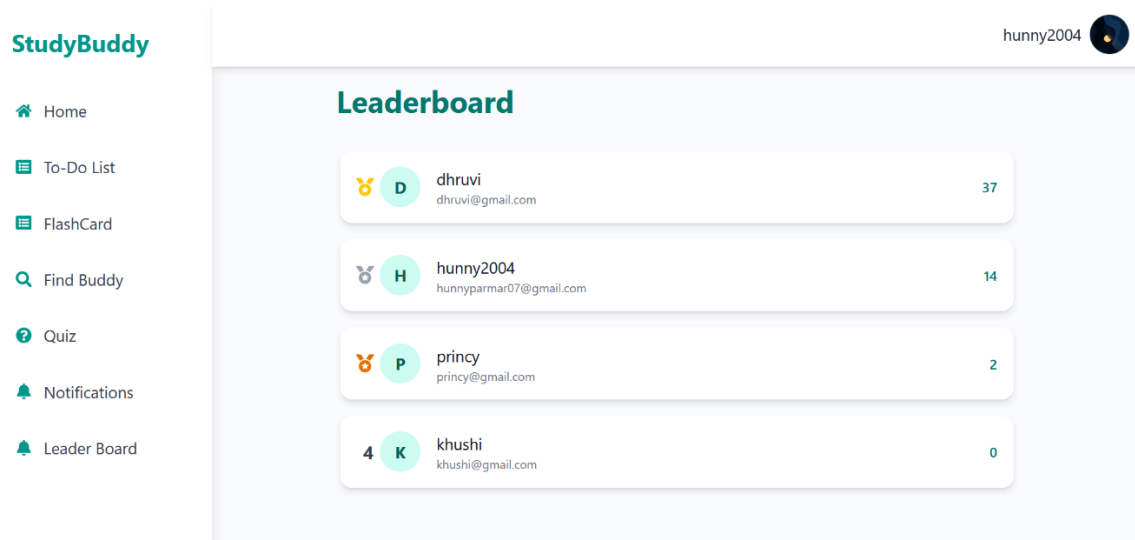
Score: **4 / 20** | Time taken: 0 min 31 sec

Detailed questions not available for this quiz.

LiveChat :-



Leader Board :-



Progress Tracking :-

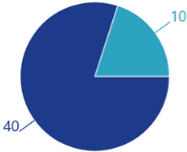
StudyBuddy

- Home
- To-Do List
- FlashCard
- Find Buddy
- Quiz
- Notifications
- Leader Board

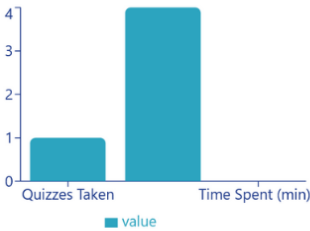
hunny2004

Study Progress Overview

Flashcard Progress



Quiz Progress



Recently Reviewed Flashcards

Last Updated
22/4/2025, 5:16:55 pm



System Architecture

The StudyBuddy platform is developed using a modern full-stack architecture that integrates frontend and backend technologies with real-time communication, cloud-based storage, AI-based quiz generation, and secure authentication mechanisms.

The architecture follows a client-server model with well-defined responsibilities at each layer:

- **Frontend :-**

Technology Stack:

- React.js with Vite for fast development and optimized builds
- Zustand for lightweight and scalable state management
- Axios for handling HTTP requests to the backend APIs
- Socket.io-client for real-time chat and audio communication

Responsibilities:

- Renders the user interface and manages user interactions
- Manages client-side routing and state (e.g., user authentication, chat state)
- Sends requests to backend APIs for data processing (e.g., quiz creation, flashcard storage)
- Establishes WebSocket connections for live chat and voice call functionality
- Handles drag-and-drop UI for task management

- **Backend**

Technology Stack:

- Node.js with Express.js for RESTful API development
- Socket.io (server-side) to enable real-time bidirectional communication
- Gemini API integration for AI-based quiz generation from user-uploaded content
- JWT (jsonwebtoken) for secure, stateless authentication
- Multer for handling file uploads such as PDFs and profile pictures

Responsibilities:

- Handles business logic and routes (e.g., user registration, login, task updates)
- Processes uploaded files and extracts data for Gemini API
- Manages authentication and authorization
- Stores, retrieves, and manipulates data via MongoDB

- Coordinates chat events and real-time communication using Socket.io

- **Database**

Technology Stack:

- MongoDB as the NoSQL database
- Mongoose for schema modeling and interaction with MongoDB

Responsibilities:

- Stores user data, tasks, flashcards, quiz questions, chat messages, and performance statistics
- Provides indexed and efficient querying for fast data retrieval (e.g., smart matching)
- Supports object relationships using referencing (ref in Mongoose)

- **File Uploads & Storage**

Technology Stack:

- Multer for multipart/form-data parsing in Express

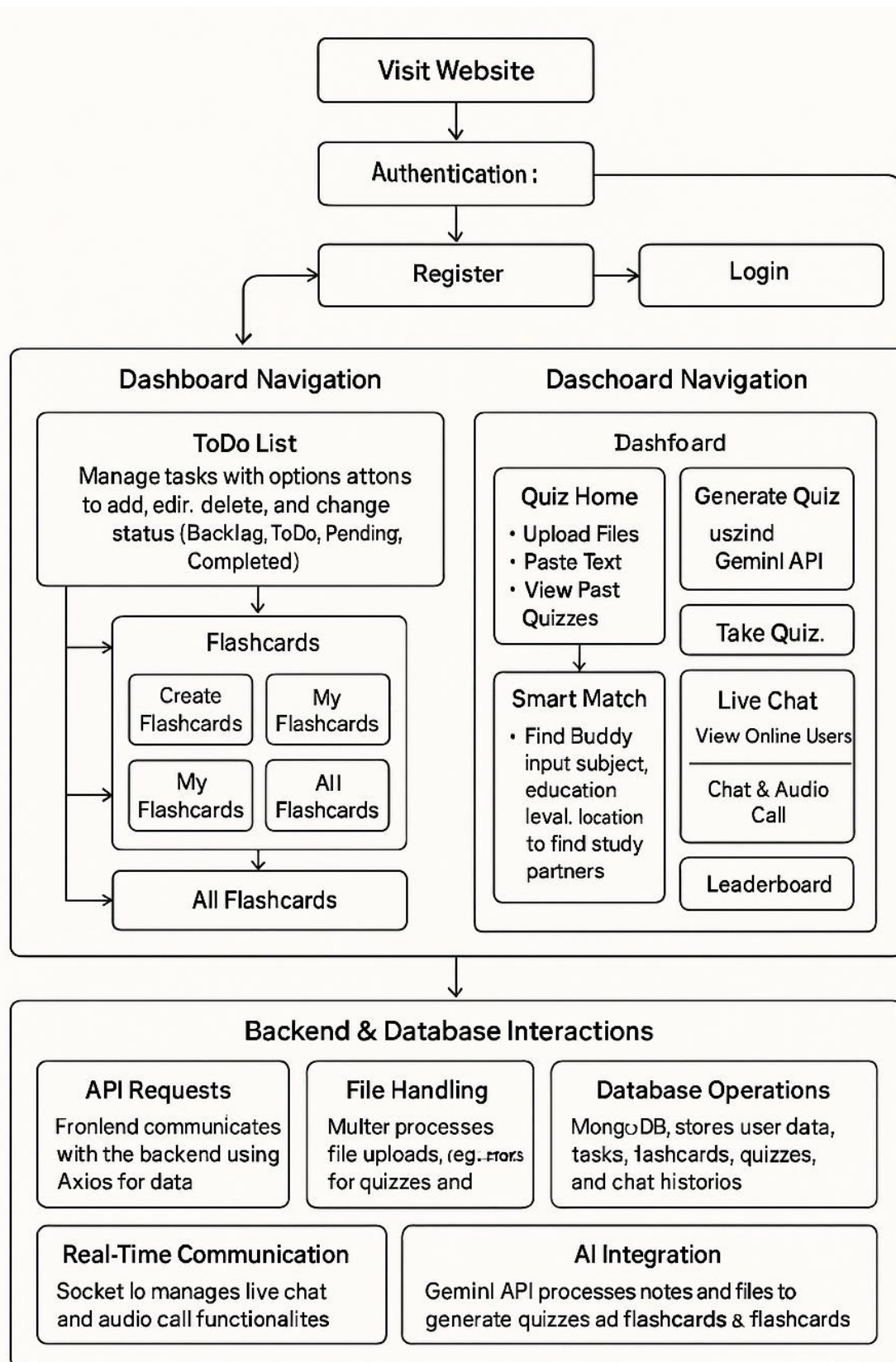
Responsibilities:

- Handles secure file uploads for:
- PDF documents used in quiz generation
- Profile pictures for user profiles
- Temporarily stores files for further processing (e.g., text extraction before sending to Gemini API)

- **System Integration Overview**

- The React frontend communicates with the Express backend using REST APIs (via Axios).
- The backend authenticates users using JWT and stores sessions securely.
- Quiz generation is triggered by uploading files, which are processed and sent to the Gemini API, then stored in MongoDB.
- Real-time features (chat and audio) are handled by Socket.io, using WebRTC and signaling channels.
- The MongoDB database stores all persistent data and supports fast querying for modules like Smart Matching and Leaderboard.

❖ System flowchart



Code Methodology

❖ Code rules/guidelines/style

- We use React.js for building the frontend and Node.js for the backend logic.
- MongoDB is our primary database, used along with Mongoose for data modeling.
- Tailwind CSS is used for creating a clean, responsive UI design.
- All API calls are handled using Axios, with authentication tokens managed using localStorage and interceptors.
- Asynchronous operations across frontend and backend are wrapped in try-catch blocks for effective error handling.
- Zustand manages global application states such as user data, chat, and call information.
- Multer is used on the backend to handle file uploads like PDFs and profile images.
- Socket.io powers real-time chat and call functionalities between users.
- The Gemini API is used to generate quizzes and flashcards from user-uploaded files or text input.

Testing

❖ Unit Testing

Test ID	Module/Feature	Test Case	Expected Outcome	Actual Outcome	Result
UT01	User Registration/Login	New user registration and login with JWT auth	User registered and redirected to dashboard	Works as expected	Pass
UT02	Flashcards (Manual Creation)	Create, update, delete flashcards manually	Flashcards are created, edited, deleted	All operations successful	Pass
UT03	Flashcards (AI Generated)	Upload PDF and generate flashcards via Gemini AI	Flashcards extracted from document	Minor text spacing issues	Pass
UT04	Quiz Generator (Text Input)	Generate quiz questions from entered text	Valid multiple-choice questions generated	Good quality, logical MCQs	Pass
UT05	Quiz Generator (PDF Input)	Generate quiz from uploaded PDF	Quiz questions based on content	Quiz generated correctly	Pass
UT06	To-Do List Manager	Add, edit, delete, move tasks across status boards	Tasks updated and moved successfully	Works as expected	Pass
UT07	Search by Country Filter	Filter users by selected country	Accurate user list based on country	Dropdown filter works perfectly	Pass
UT08	Quiz Submission and Scoring	Submit quiz and calculate score	Correct score and time displayed	Accurate scoring and timing	Pass

❖ Integration Testing Approach

Integration ID	Modules Integrated	Test Description	Expected Result	Actual Result	Result
IT01	Frontend ↔ Backend (Login/Signup)	Validate API integration for user authentication	Successful login/signup and token generation	Login/signup works smoothly	Pass
IT02	Flashcards ↔ Database + AI Service	Test PDF upload, AI generation, and saving flashcards	Flashcards created automatically from PDF	Generated flashcards with minor text errors	Pass
IT03	Quiz ↔ AI ↔ Database	Generate quiz, attempt quiz, submit score to DB	Quizzes generated and scores stored	Score and time stored accurately	Pass
IT04	Chat (Messaging) ↔ Socket.io Server	Test real-time messaging between two users	Instant message delivery	Messages delivered instantly	Pass
IT05	Chat (Audio Call) ↔ WebSocket	Test live audio call between two users	Audio call connection established	Audio call failed to connect	Fail
IT06	To-Do List ↔ Backend	Validate syncing of tasks with database	Tasks saved, updated, deleted correctly	Works fine	Pass
IT07	Search Filter ↔ User Data	Search users by country	Results filtered accurately	Correct users displayed	Pass

❖ System Testing

System Test ID	Area	Test Scenario	Expected Outcome	Actual Outcome	Result
ST01	Full User Flow	Register → Setup Profile → Use Dashboard → Logout	Smooth flow without errors	Entire flow is smooth	Pass
ST02	Flashcards End-to-End	Create flashcards manually and via AI → Review cards	All flashcards accessible and accurate	Flashcards work; minor AI formatting issues	Pass
ST03	Quiz End-to-End	Generate quiz → Attempt quiz → View history	Scores, time and answers saved	History and performance tracked correctly	Pass
ST04	Chat Functionality	Message and call between users	Real-time messaging, voice call connected	Messaging works, voice call fails	Partial Pass
ST05	Performance and Load Handling	Test with large flashcard sets and quizzes	App remains responsive and loads fast	Good performance with minor lags under load	Pass
ST06	Security	Check input validation, session security, and API protection	No unauthorized access or form exploits	Validation and protections are active	Pass
ST07	Accessibility	Navigate via keyboard, check contrast and ARIA compliance	Meets accessibility standards	Minor ARIA label improvements needed	Pass

Future Enhancement

❖ **Future Enhancement**

Dark Mode

Implement a user-selectable dark theme for better night-time usage and reduced eye strain.

Video Calling Support

Extend current audio call functionality to support video conferencing for more engaging study sessions.

Voice Notes in Chat

Allow users to send voice notes in the live chat module for faster communication.

Flashcard Sharing

Enable users to share their flashcards with friends or groups.

Study Groups Feature

Let users create or join group rooms for collaborative study with integrated group chat and shared to-dos.

Gamification

Introduce rewards, badges, and achievements for completing quizzes, flashcards, and daily tasks.

AI-based Smart Suggestions

AI-driven study buddy recommendations and flashcard generation based on learning history.

Multi-language Support

Allow users to switch between languages for global usability.

Admin Dashboard

Provide limited moderation tools for managing inappropriate content or fake profiles (if needed).

Bibliography & References

References are as follows:

React :-

<https://reactjs.org>

Nodejs :-

<https://nodejs.org>

MongoDB :-

<https://www.mongodb.com>

Tailwindcss :-

<https://tailwindcss.com>

<https://axios-http.com>

<https://zustand-demo.pmnd.rs>

<https://socket.io>

<https://quizlet.com>

<https://studystream.live>