Project Proposal: AI-Powered Study Buddy

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1. Project Overview

AI-Powered Study Buddy is a Software as a Service (SaaS) web application designed to assist students in organizing study materials, tracking progress, and generating AI-powered study guides. It provides a collaborative space where users can share materials and receive AI-generated enhancements for better learning.

The application is built on the MERN (MongoDB, Express.js, React, Node.js) stack and integrates AI-driven features to enhance the study experience. The OpenAI GPT API will provide text summarization and quiz generation, while the Wikipedia API will serve as a secondary resource for retrieving additional study content.

2. Key Features & Functionality

Anonymous Users

- Browse and search for study materials
- View AI-generated summaries of study topics
- Explore trending topics and most-viewed study materials

Authenticated Users (Regular)

- Create, edit, and delete their own study materials
- Automatically generate study guides (AI-powered summaries)
- Take quizzes generated by AI based on study material content
- Bookmark study topics for later review
- Sort and filter study materials based on popularity and recency

Admin Users

- Access an admin dashboard for flagged study materials
- Review and delete inappropriate or flagged content
- View admin stats (Total Reports, Resolved, Pending)

3. Page Requirements Mapping

The application consists of five core pages that satisfy the project requirements.

Page	Route	Description
Homepage	/ or /home	Displays trending study materials and AI-suggested topics, includes sorting & filtering options.
Login/Register Page	/login	Allows users to register/login for personalized study tracking.
Profile Page	/profile	Displays user profile, study materials, bookmarks, and admin tools if applicable.
Search Page	/search?query=...	Users can search study topics, sort results, and access AI-enhanced content, includes sorting & filtering options.
Details Page	/study/{id}	Displays full study material, AI-generated summaries, quizzes, and a flag content option.
Admin Dashboard	/admin	Allows admins to manage flagged content, delete inappropriate materials, and track system reports.

4. Technology Stack (MERN)

Component	Technology Used
Frontend	React (Material-UI for styling, Axios for API calls)
Backend	Node.js & Express.js (RESTful API, JWT authentication)
Database	MongoDB (MongoDB Atlas for cloud-based storage)
Authentication	JWT (JSON Web Tokens) + bcrypt for password hashing
Hosting	Vercel/Render (Frontend), MongoDB Atlas (Database)

5. External APIs

The project will integrate two external APIs, including one AI-driven API:

1. **AI-Powered API: OpenAI GPT API**
    - Use case:
        - Summarization: Converts long study materials into concise summaries.
        - Quiz Generation: Automatically creates multiple-choice and short-answer questions based on study notes.

2. **Non-AI API: Wikipedia API**

    - Use case:
        - Retrieves additional study content related to user-searched topics.
        - Enhances learning by providing contextual information.

6. Database Schema (MongoDB Collections)

The project will have **four main collections** in MongoDB to accommodate the additional requirements.

1. users Collection

Stores user information, study progress, and role-based access control.

Schema:

```
{
  "_id": "ObjectId",
  "username": "string",
  "email": "string",
  "password": "hashed_string",
  "role": "string",  // "user" or "admin"
}
```

2. study_materials Collection

Stores uploaded study materials, AI-generated summaries, and associated metadata.

Schema:

```
{
```

```
  "_id": "ObjectId",
  "title": "string",
  "content": "string",
  "user_id": "ObjectId", // reference to users
  "views": "number",
  "created_at": "timestamp",
  "updated_at": "timestamp"
}
```

3. quizzes Collection

Stores **AI-generated quizzes** linked to study materials.

Schema:

```
{
  "_id": "ObjectId",
  "study_material_id": "ObjectId", // reference to study_materials
  "questions": [ // array of AI-generated questions
    {
      "question_text": "string",
      "options": ["string", "string", "string", "string"],
      "correct_answer": "string"
    }
  ]
}
```

4. admin_reports Collection (For flagged content)

Schema:

```
{
  "_id": "ObjectId",
  "study_material_id": "ObjectId",  // References study_materials
  "reason": "string",
  "flagged_by": "ObjectId",  // References users
  "status": "string" (pending/resolved)
}
```

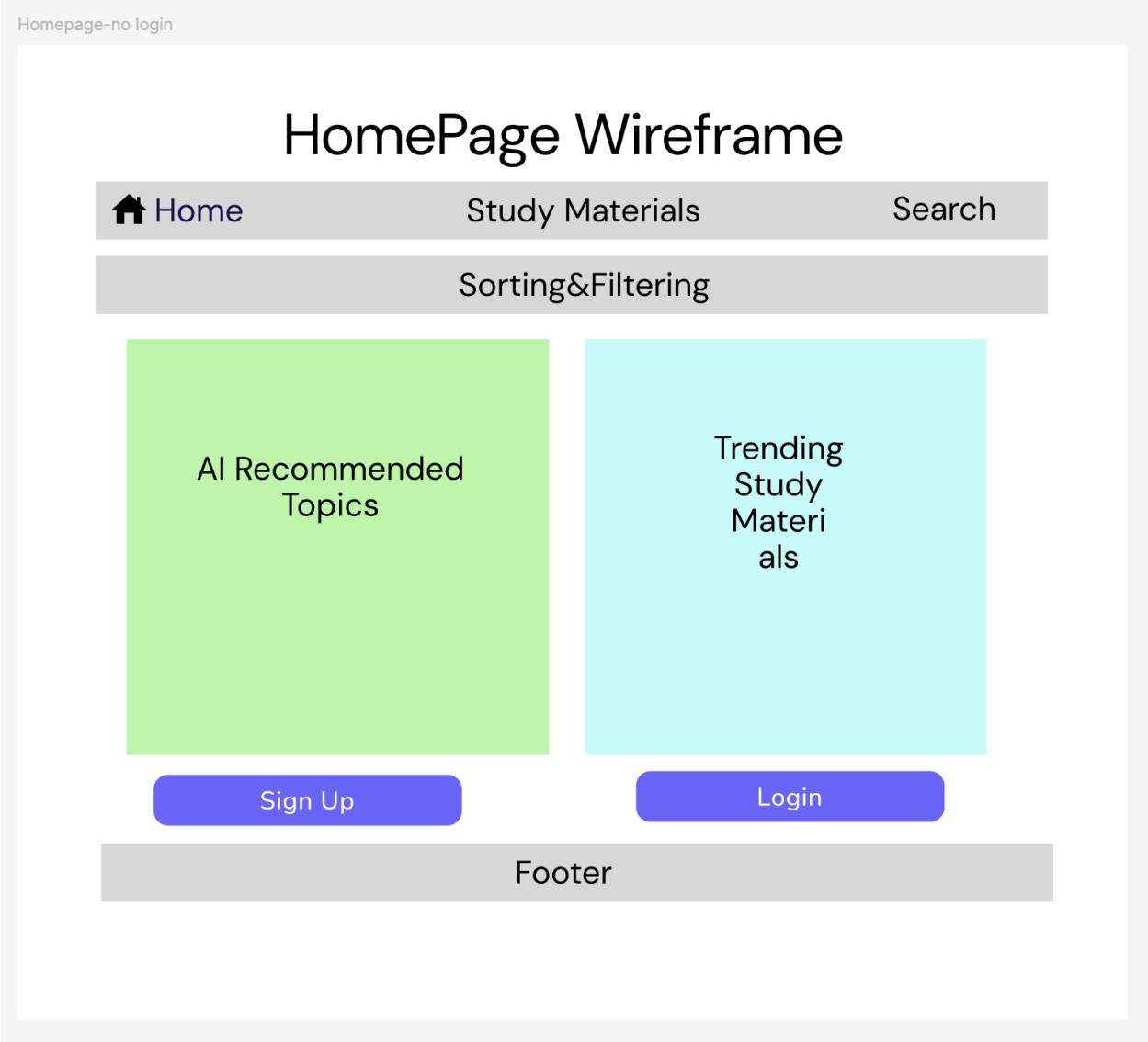
7. CRUD Operations on MongoDB Collections

Operation	Users	Study Materials	Quizzes	Admin Reports
Create	Register new users	Users can add study materials	AI generates quizzes from study materials	Users flag inappropriate content
Read	Retrieve user profiles	View study content	Users can take quizzes	Admins review flagged reports
Update	Modify user details	Users can edit their own study materials	Not required (quizzes are static once generated)	Admins mark reports as resolved
Delete	Remove user accounts (admin-only)	Users can delete their own study materials, admins can remove flagged content	Admins can remove outdated or inappropriate quizzes	Admins can remove flagged content

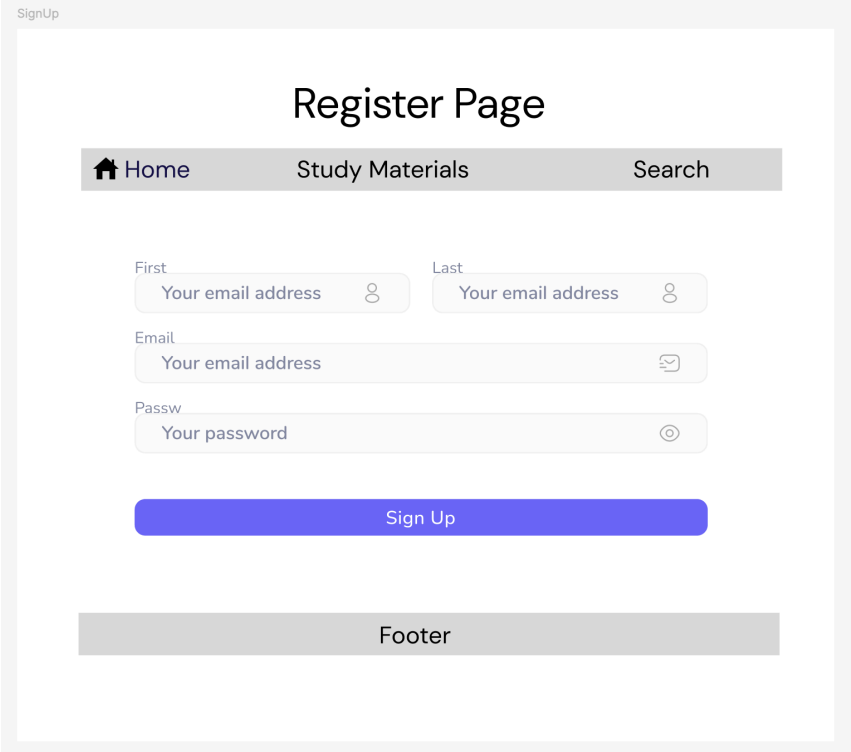
8. Wireframe Prototypes (Desktop)

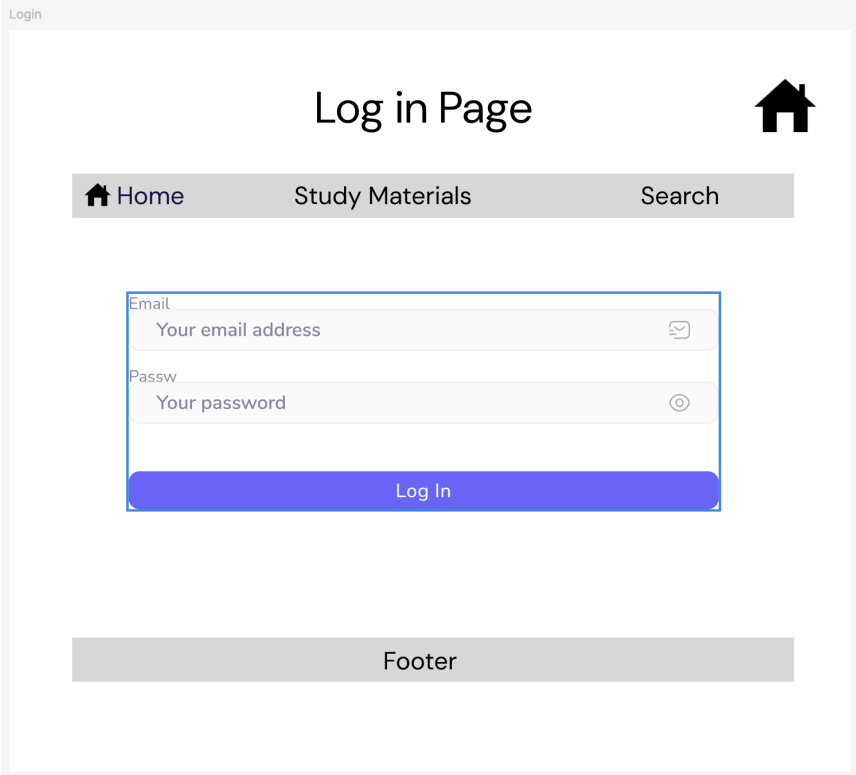
Here's a desktop-friendly UI layout for the five required pages:

Homepage Before Login

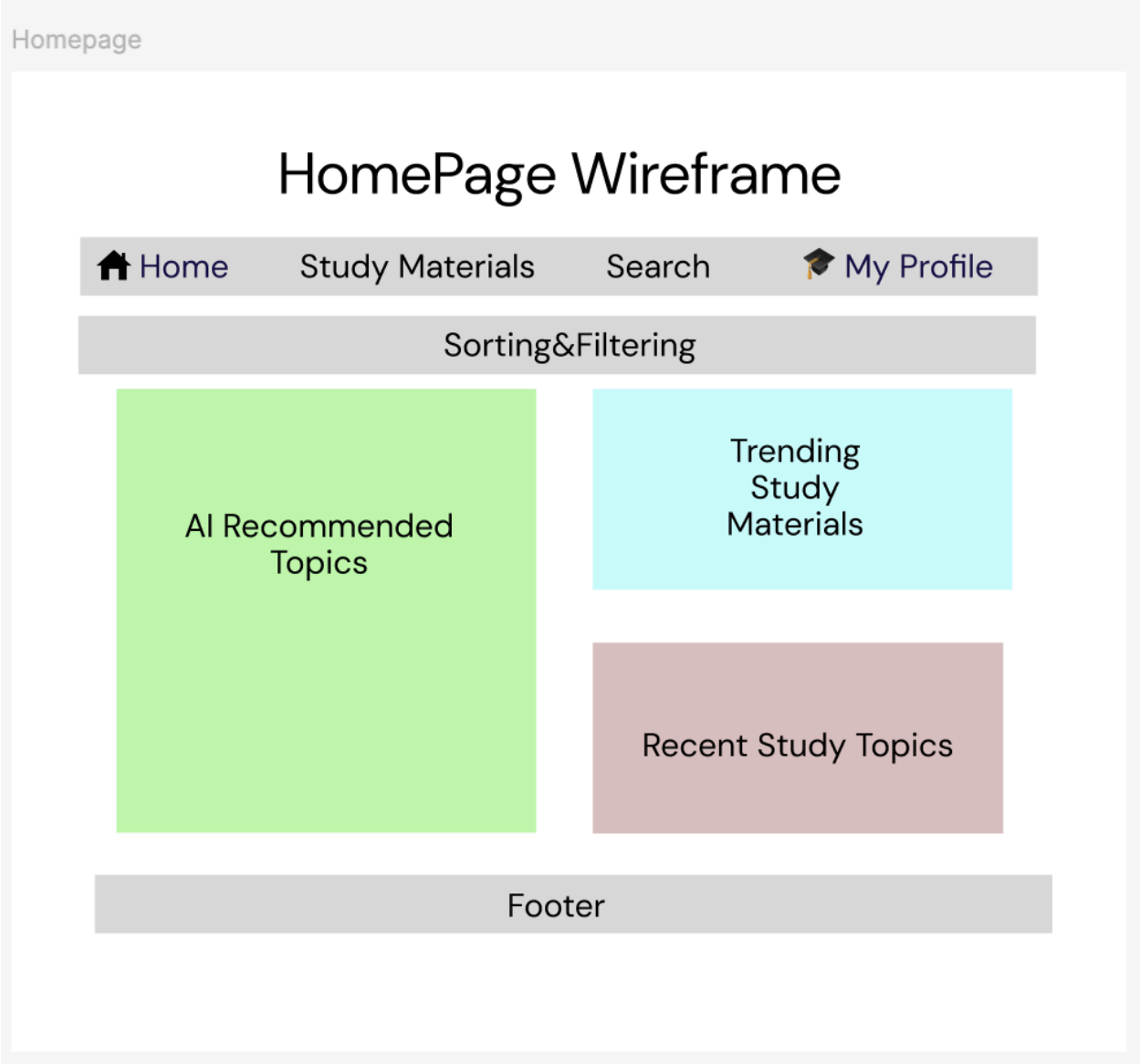


Register/Login Page

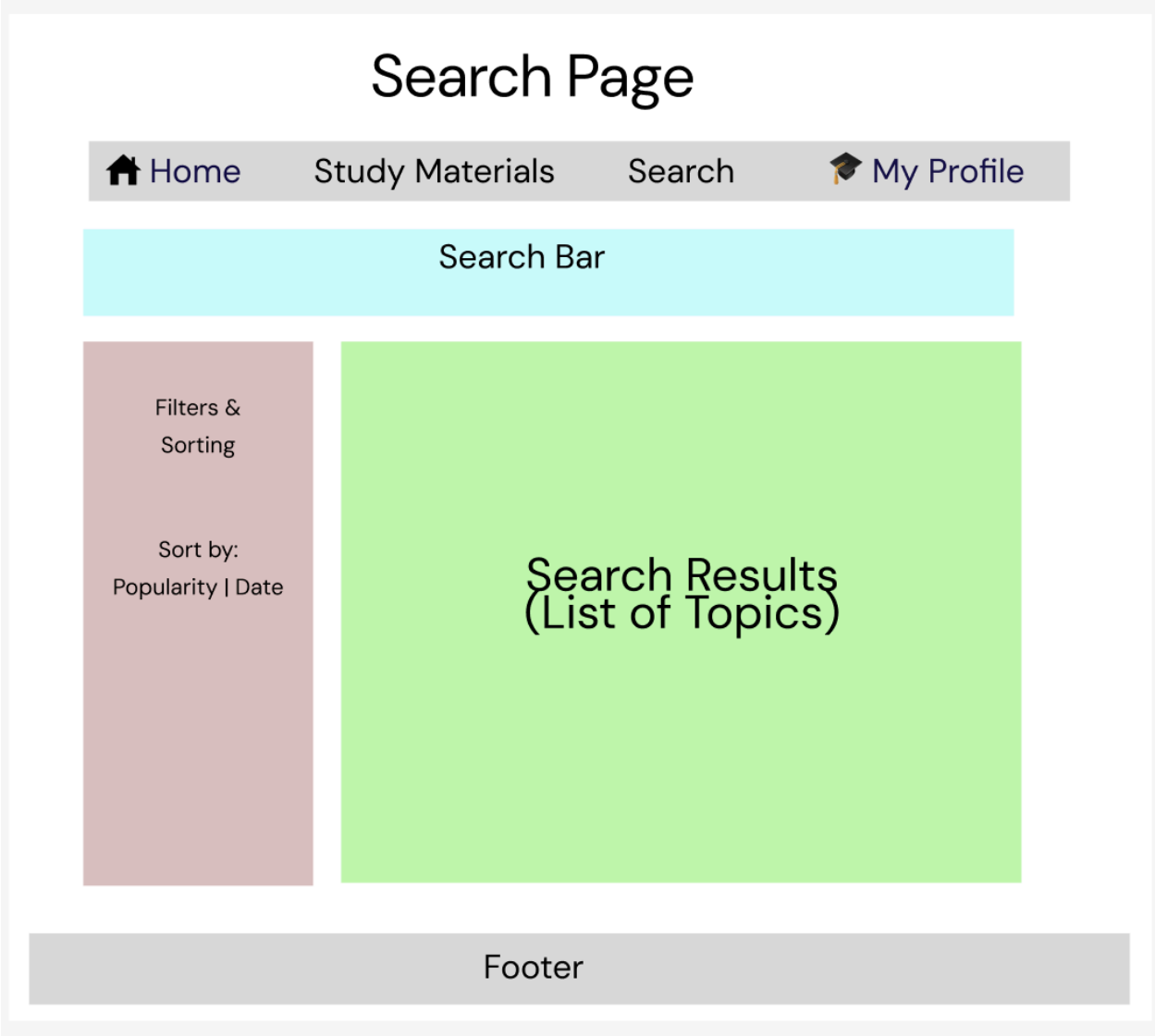




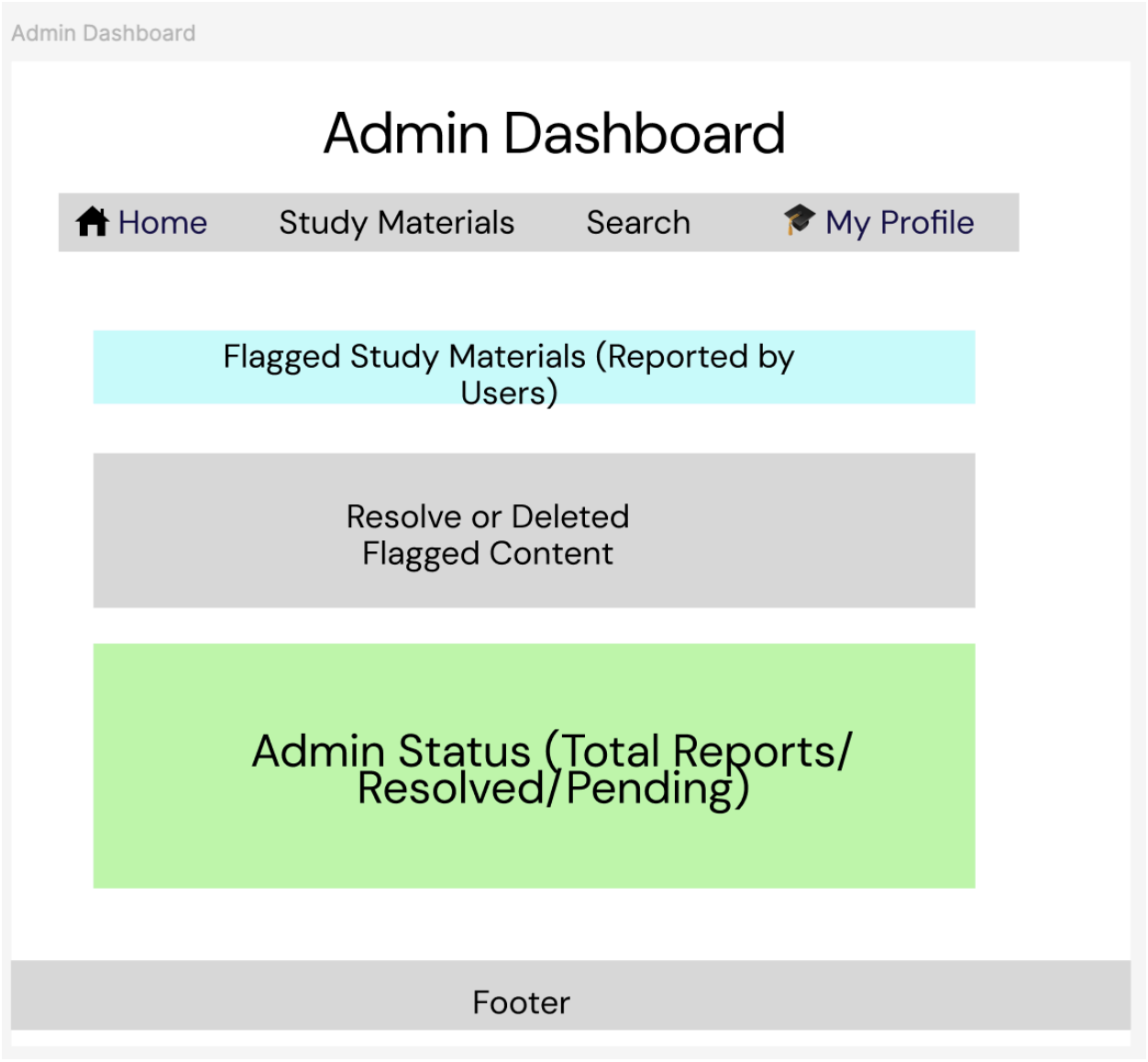
Home Page After Login



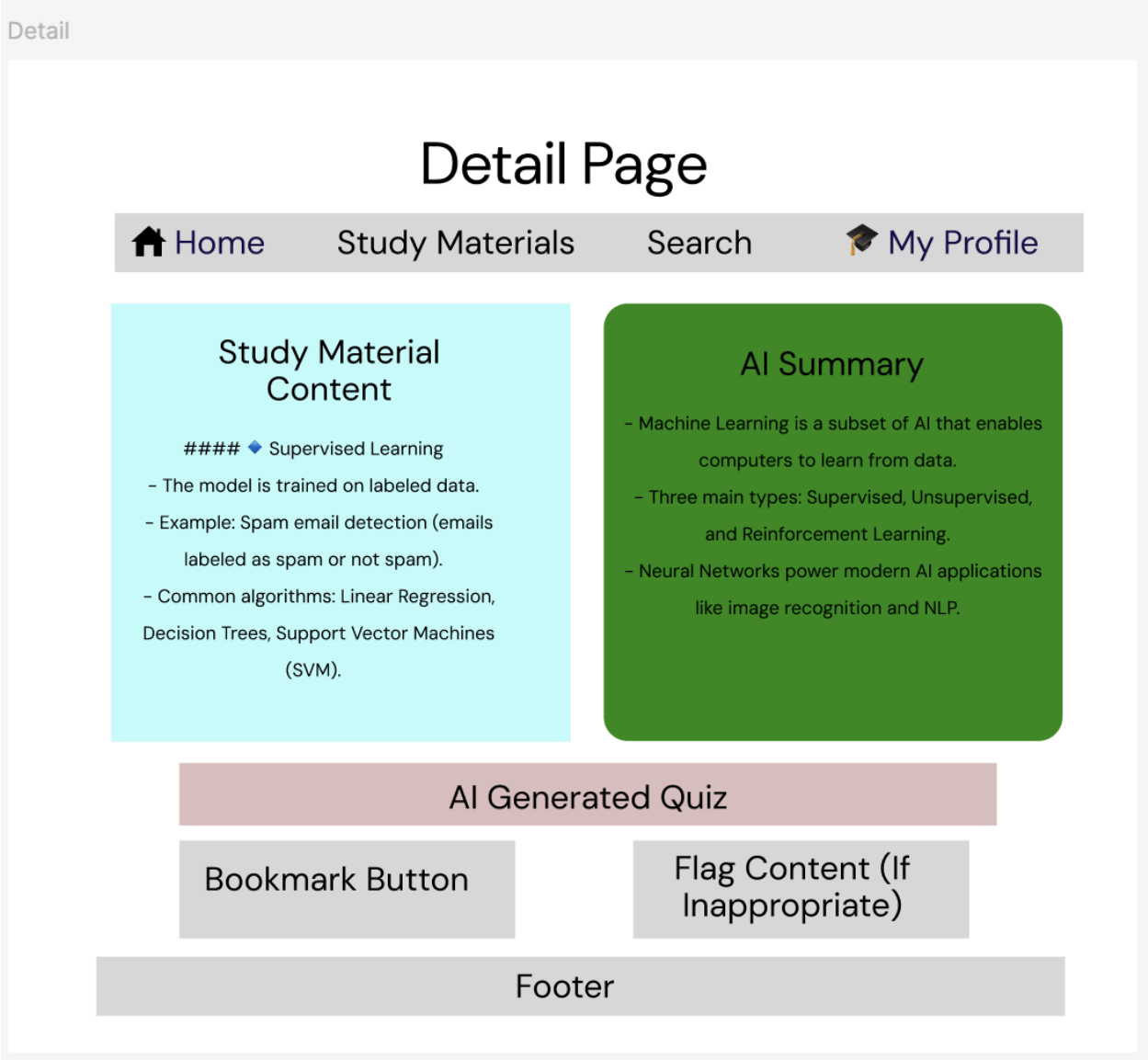
Search Page


Search Page
Home
Study Materials
Search
My Profile
Search Bar
Filters &
Sorting
Sort by:
Popularity | Date
Search Results
(List of Topics)
Footer

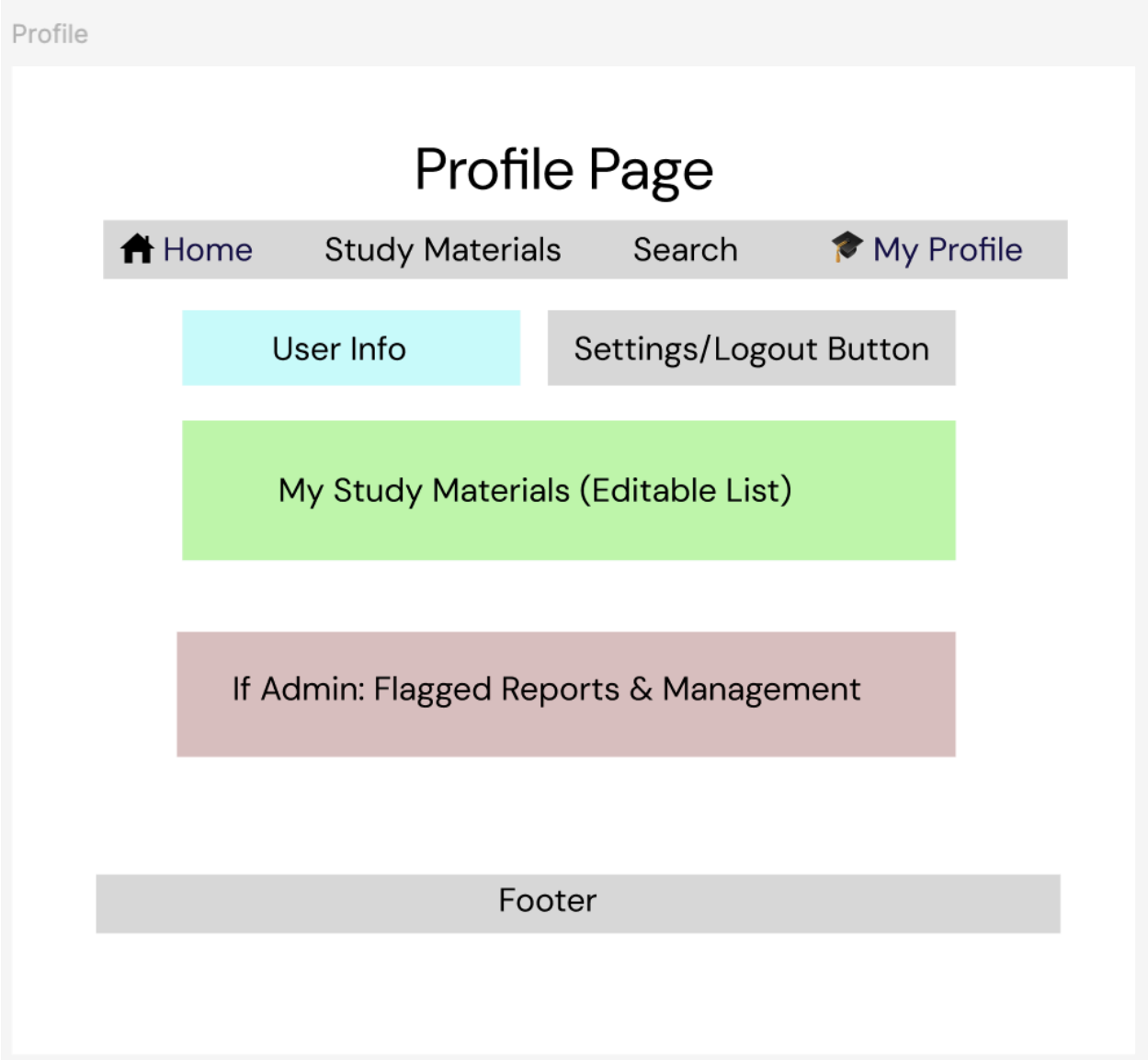
Admin Dashboard



Detail Page


Detail
Detail Page
Home
Study Materials
Search
My Profile
Study Material Content
🔹 Supervised Learning
- The model is trained on labeled data.
- Example: Spam email detection (emails labeled as spam or not spam).
- Common algorithms: Linear Regression, Decision Trees, Support Vector Machines (SVM).
AI Summary
- Machine Learning is a subset of AI that enables computers to learn from data.
- Three main types: Supervised, Unsupervised, and Reinforcement Learning.
- Neural Networks power modern AI applications like image recognition and NLP.
AI Generated Quiz
Bookmark Button
Flag Content (If Inappropriate)
Footer

Profile Page



9. User Experience & Accessibility

- Fully responsive design for desktop, tablet, and mobile.
- Tested devices: iPad (tablet), iPhone 13 (mobile).
- No unintended overlapping or scrolling issues.
- Easy navigation: Clear buttons for profile, home, login.
- Large clickable areas to avoid tiny links.
- Error messages with fix suggestions.
- Lighthouse Accessibility Score: Target 100 (with report).

10. Competitive Analysis

We researched two similar platforms:

1. Quizlet (www.quizlet.com)
    - Pros: Large community, AI-driven flashcards.
    - Cons: No AI-generated summaries, focus on pre-existing content.
2. Notion AI (www.notion.so)
    - Pros: AI-based content summarization.
    - Cons: Lacks educational quiz generation.

Our Unique Features:

- AI-generated quizzes (unlike Notion).
- AI-powered summarization + search suggestions (unlike Quizlet).
- User progress tracking & bookmarking.

11. Innovation & Engagement

Why will users keep using it?

- **AI-Powered Learning:** Personalized study guides and quizzes enhance learning.
- **Bookmarking & Study Tracking:** Users save and revisit materials.
- **Collaborative Features:** Users share content, boosting engagement.
- **Gamification Potential:** Leaderboards and rewards encourage continued use.
- **Quality Content Moderation:** Flagging ensures reliable study materials.

12. Development Timeline (3 Weeks)

Week	Tasks
Week 1	Set up the MERN stack, implement authentication (JWT), design

	database schema, and create API endpoints.
Week 2	Develop frontend pages, integrate API calls, implement AI-powered features (summaries & quizzes).
Week 3	Finalize UI, optimize performance, add admin dashboard, and test responsiveness and accessibility.

13. Conclusion

AI-Powered Study Buddy is an innovative SaaS-based MERN application that enhances learning efficiency through AI-generated summaries and quizzes. It provides dynamic, user-friendly, and AI-assisted learning tools to help students retain knowledge effectively.

With MongoDB, React, Express, Node.js, and AI-powered API integration, this project is well-positioned to offer a unique and engaging study platform.