Full Stack Development with MERN Project Documentation format

1. Introduction

- **Project Title:** EduTutor AI: Personalized Learning with Generative AI and LMS Integration
- **Team Members:**
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  2) Vyshnavi Yamini,
  3)Amasa Poojasree,
  4)Damarakuppam Varshitha,
  5)S.Yughandhar Kumar

2. Project Overview

• Purpose: EduTutor AI aims to revolutionize personalized education by integrating Generative AI with Learning Management Systems (LMS). It provides intelligent tutoring, adaptive content generation, and personalized learning pathways based on learner profiles and performance.

• Features:

- AI-powered virtual tutor using LLMs
- Dynamic question and content generation
- Student performance analytics dashboard
- LMS integration for course content and user management
- Chat-based learning assistant
- Multi-role access (Admin, Instructor, Student)

3. Architecture

• Frontend: Developed using React.js with Tailwind CSS. Includes interactive dashboard, chat interface, and quiz modules.
• Backend: Built with Node.js and Express.js. Integrates OpenAI or Hugging Face APIs and LMS via REST APIs.

• Database: MongoDB for storing users, sessions, chat logs, course metadata, and AI interactions.

4. Setup Instructions

• Prerequisites: Node.js, MongoDB, and AI API access (e.g., OpenAI API key).

• Installation:

1. Clone the repository

2. Navigate to the client and server folders

3. Run `npm install` in both

4. Create `.env` files with required variables (e.g., DB_URI, OPENAI_KEY)

5. Start the development servers

5. Folder Structure

- **Client:**

  /components - UI Components

  /pages - Main Pages

  /assets - Images and styles

  /utils - Helper functions
- **Server:**
  /controllers - Logic for each route
  /models - Mongoose schemas
  /services - AI and LMS integrations
  /middleware - Auth, logging

6. Running the Application

• Frontend:
npm start in the client directory.

• Backend:

npm start in the server directory.

7. API Documentation

• Document all backend endpoints, for example:

- POST /api/chat – Handle AI chat messages

- GET /api/courses – Fetch LMS courses
- POST /api/quiz/generate – Generate quiz using AI

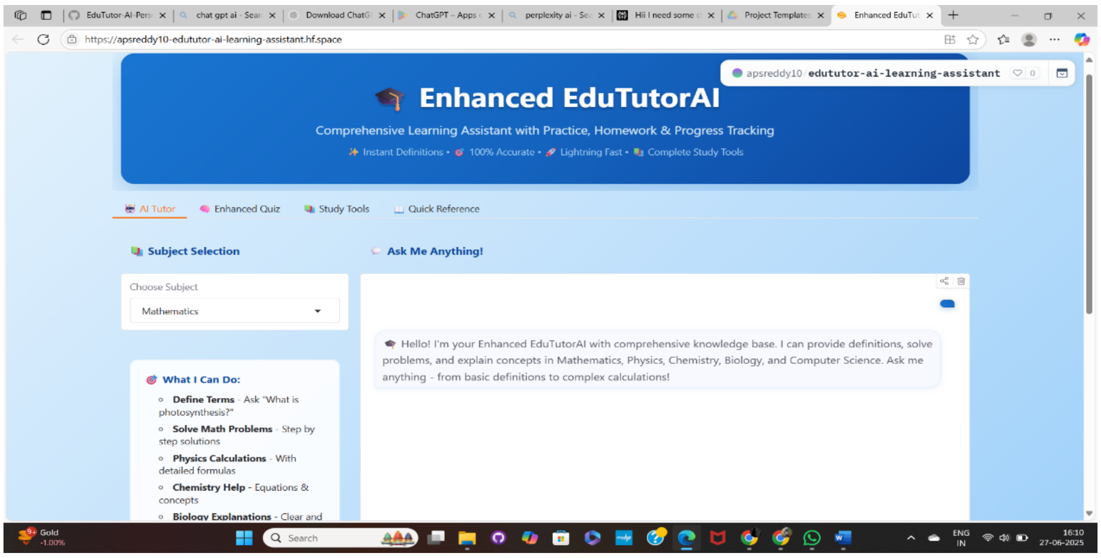
• Include request structure, response examples, and authentication requirements.

8. Authentication

• JWT-based authentication with role-based access (Student, Instructor, Admin).

• Middleware used for protected routes.

9. User Interface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Enhanced EduTutorAI

Comprehensive Learning Assistant with Practice, Homework & Progress Tracking

✨ Instant Definitions • 🎯 100% Accurate • 🚀 Lightning Fast • 📚 Complete Study Tools

Subject Selection

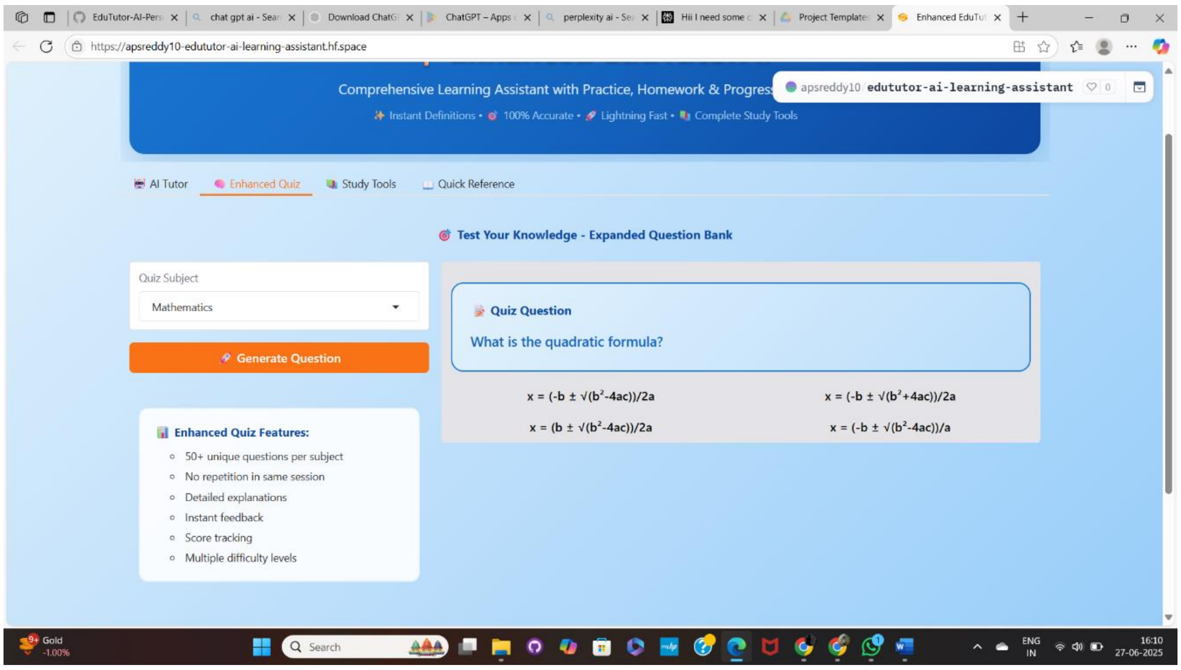
Choose Subject: Mathematics

What I Can Do:

- **Define Terms** - Ask "What is photosynthesis?"
- **Solve Math Problems** - Step by step solutions
- **Physics Calculations** - With detailed formulas
- **Chemistry Help** - Equations & concepts
- **Biology Explanations** - Clear and

Ask Me Anything!

Hello! I'm your Enhanced EduTutorAI with comprehensive knowledge base. I can provide definitions, solve problems, and explain concepts in Mathematics, Physics, Chemistry, Biology, and Computer Science. Ask me anything - from basic definitions to complex calculations!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Test Your Knowledge - Expanded Question Bank

Quiz Subject: Mathematics

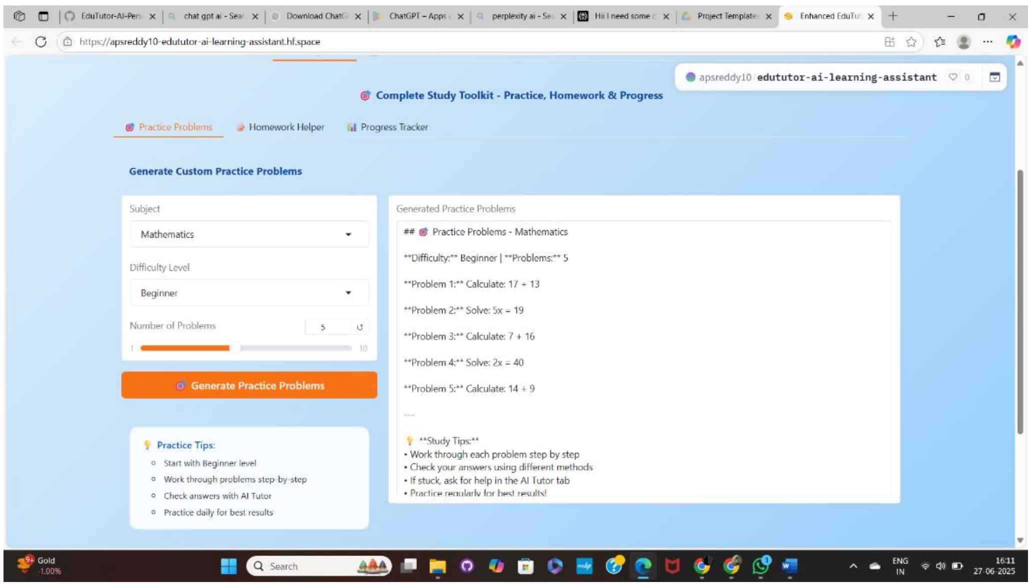
Enhanced Quiz Features:

- 50+ unique questions per subject
- No repetition in same session
- Detailed explanations
- Instant feedback
- Score tracking
- Multiple difficulty levels

Quiz Question

What is the quadratic formula?

- $x = (-b \pm \sqrt{(b^2-4ac)})/2a$
- $x = (-b \pm \sqrt{(b^2+4ac)})/2a$
- $x = (b \pm \sqrt{(b^2-4ac)})/2a$
- $x = (-b \pm \sqrt{(b^2-4ac)})/a$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Complete Study Toolkit - Practice, Homework & Progress

Generate Custom Practice Problems

Subject: Mathematics

Difficulty Level: Beginner

Number of Problems: 5

Practice Tips:

- Start with Beginner level
- Work through problems step-by-step
- Check answers with AI Tutor
- Practice daily for best results

Generated Practice Problems

```
## 🎯 Practice Problems - Mathematics

**Difficulty:** Beginner | **Problems:** 5

**Problem 1:** Calculate: 17 + 13

**Problem 2:** Solve: 5x = 19

**Problem 3:** Calculate: 7 + 16

**Problem 4:** Solve: 2x = 40

**Problem 5:** Calculate: 14 + 9

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💡 **Study Tips:**
• Work through each problem step by step
• Check your answers using different methods
• If stuck, ask for help in the AI Tutor tab
• Practice regularly for best results!
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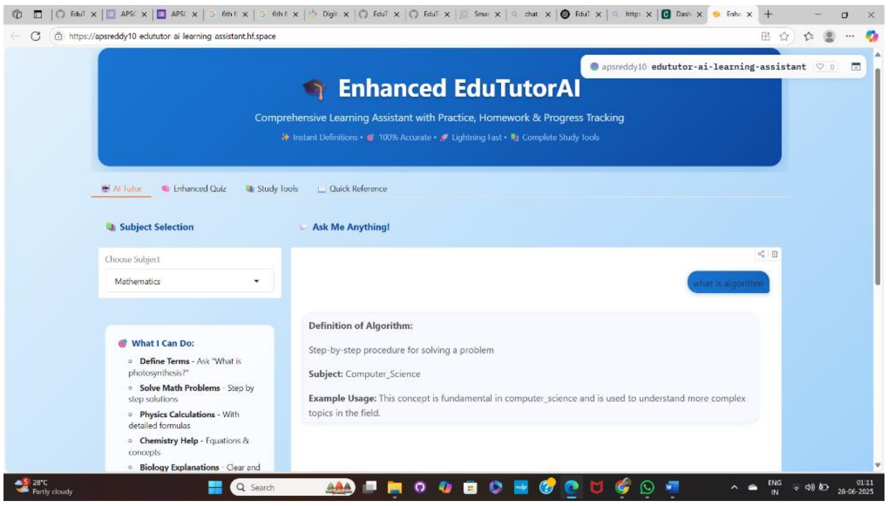
10. Testing

- Manual testing of UI flows.
- Postman for API testing.
- Jest or Mocha for backend unit tests (optional).

11. Screenshots or Demo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Ask Me Anything!

what is algorithm

Definition of Algorithm:

Step-by-step procedure for solving a problem

Subject: Computer_Science

Example Usage: This concept is fundamental in computer_science and is used to understand more complex topics in the field.

- **Live demo link: https://apsreddy10-edututor-ai-learning-assistant.hf.space/**

12. Known Issues

- Occasional latency in AI response due to API rate limits.
- Limited LMS integration (currently supports only one platform).

13. Future Enhancements

- Multi-language support for AI interactions
- Voice-based AI assistant
- Analytics export features