EduTutor AI Project Documentation

1. Introduction

Project Title: EduTutor AI - Personalized Learning with Generative AI and LMS Integration

Team Members:

- Kambham Navya Sree (Team Lead)
- Rayavarapu Likhitha
- Shaik Muskan
- Peddapalem Revathi

2. Project Overview

Purpose: EduTutor AI is designed to bridge the personalization gap in traditional LMS platforms. The platform provides AI-powered assistance through content generation, adaptive quizzes, and interactive tutoring to create a learner-centered environment.

Features:

- AI-generated summaries and flashcards
- Adaptive quizzes from learner input
- Conversational AI tutor via text and voice
- Real-time analytics and progress tracking
- Seamless LMS integration (Moodle, Canvas)

3. Architecture

Frontend:

- Developed using React.js with TailwindCSS for responsive design
- Integrated with Gradio for AI interaction modules (chatbot and quiz)

Backend:

- Built using Flask and FastAPI for RESTful endpoints
- Handles user queries, invokes AI models, and manages LMS communication

Database:

- PostgreSQL for structured storage

- Firebase Realtime DB for real-time updates and logging

4. Setup Instructions

Prerequisites:

- Python 3.10+
- Node.js and npm
- PostgreSQL
- HuggingFace API Token (for model access)

Installation:

1. Clone the repo: `git clone https://github.com/edututor-ai`
2. Install backend dependencies:

   ```
   cd backend
   pip install -r requirements.txt
   ```

3. Install frontend dependencies:

   ```
   cd client
   npm install
   ```

4. Add `.env` file with HuggingFace token and DB credentials
5. Start backend and frontend servers

5. Folder Structure

Client (React):

- `/src`
  - `/components`: UI components like Chat, Quiz, Dashboard
  - `/pages`: Main views such as Home, Login, Profile
  - `/services`: API calls and auth services

Server (Flask + FastAPI):

- `/api`
  - `app.py`: Main API server
  - `tutor.py`: AI chat handling
  - `quizgen.py`: Quiz generator logic

- `utils/`: KnowledgeBase, MathSolver modules

6. Running the Application

Frontend:

```
cd client
npm start
```

Backend:

```
cd backend
python app.py
```

7. API Documentation

Example Endpoints:

- `POST /ask`: AI Tutor prompt processing
- `POST /generate-quiz`: Dynamic quiz creation
- `POST /analyze-homework`: Homework explanation module
- `GET /progress`: Returns learning analytics per student

Request Format: JSON **Response Format:** JSON

8. Authentication

- LMS SSO (Single Sign-On) integration planned
- Token-based sessions for non-LMS access
- Firebase auth modules configured for prototype users

9. User Interface

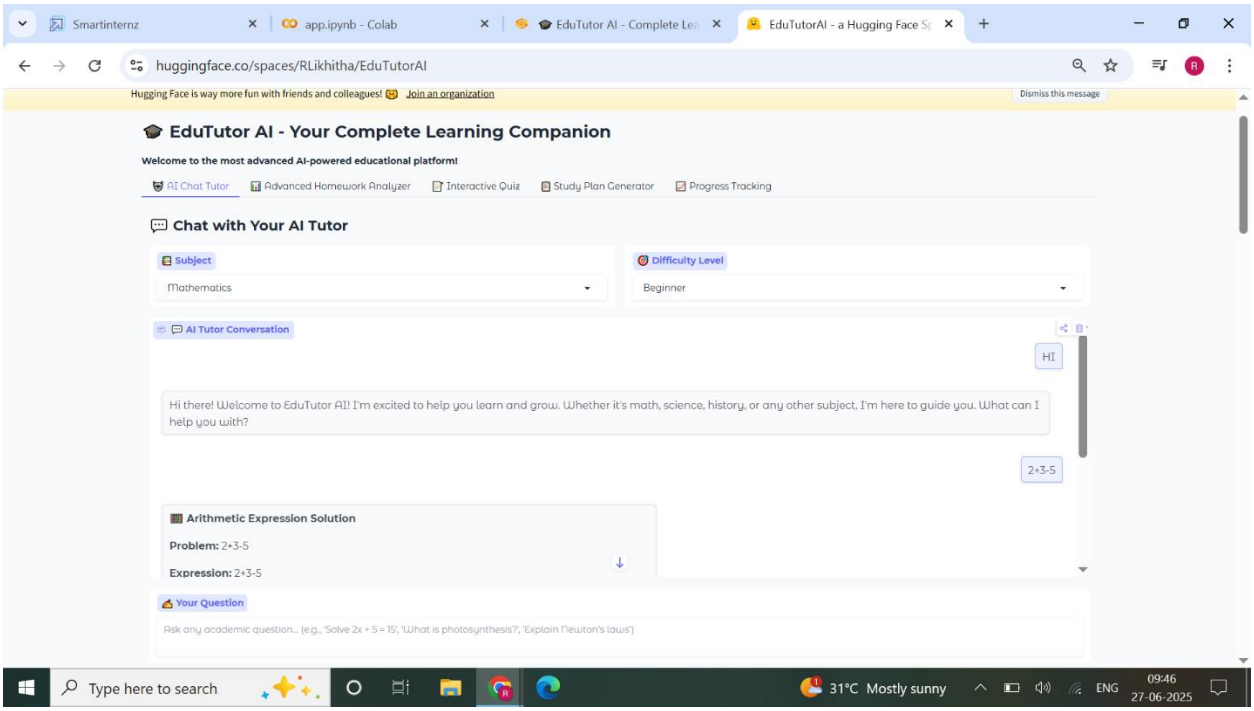
- Dashboard with summary cards and quiz links
- Embedded AI tutor chat panel
- Voice-enabled input (via Whisper ASR)
- Admin view for analytics and alerts

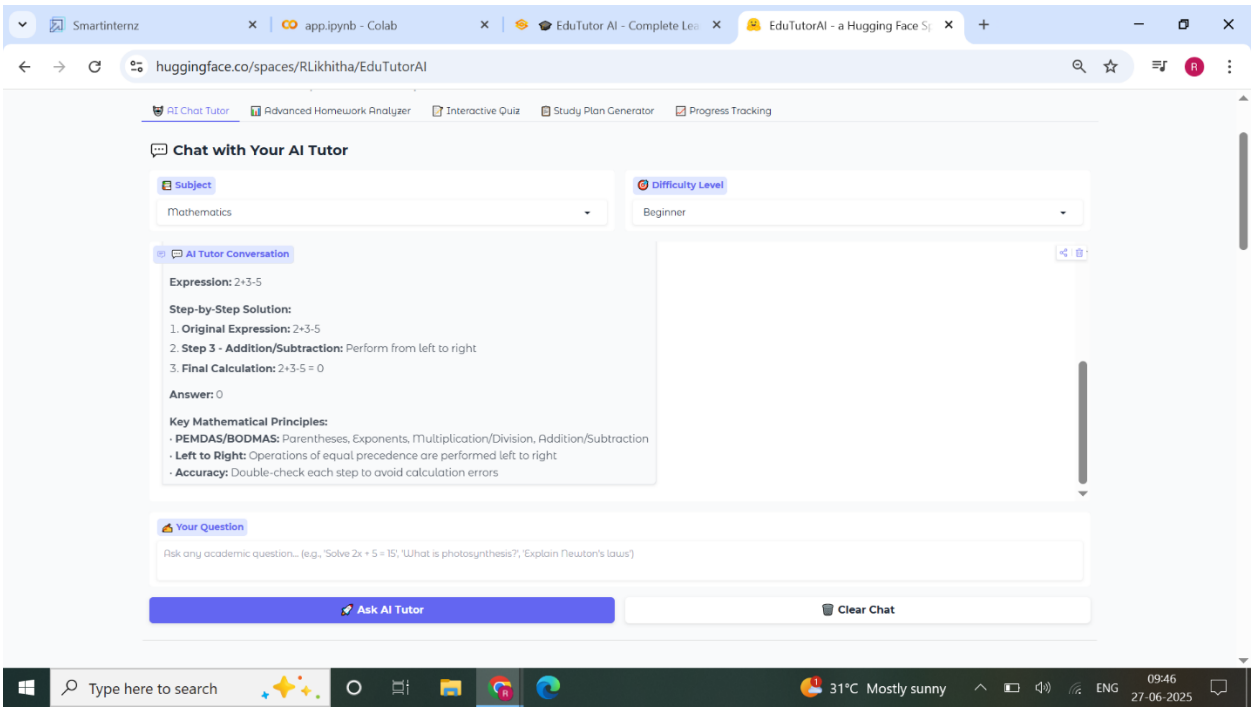
10. Testing

Strategy:

- Unit Testing: Functions and AI helpers
- Load Testing: Locust for simulating 10,000 users
- Integration Testing: LMS ↔ EduTutor ↔ AI modules

11. Screenshots or Demo

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AI Chat Tutor
Advanced Homework Analyzer
Interactive Quiz
Study Plan Generator
Progress Tracking
Chat with Your AI Tutor
Subject
Mathematics
Difficulty Level
Beginner
AI Tutor Conversation
Expression: 2+3-5
Step-by-Step Solution:
1. Original Expression: 2+3-5
2. Step 3 - Addition/Subtraction: Perform from left to right
3. Final Calculation: 2+3-5 = 0
Answer: 0
Key Mathematical Principles:
· PEMDAS/BODMAS: Parentheses, Exponents, Multiplication/Division, Addition/Subtraction
· Left to Right: Operations of equal precedence are performed left to right
· Accuracy: Double-check each step to avoid calculation errors
Your Question
Ask any academic question... (e.g., 'Solve 2x + 5 = 15', 'What is photosynthesis?', 'Explain Newton's laws')
Ask AI Tutor
Clear Chat
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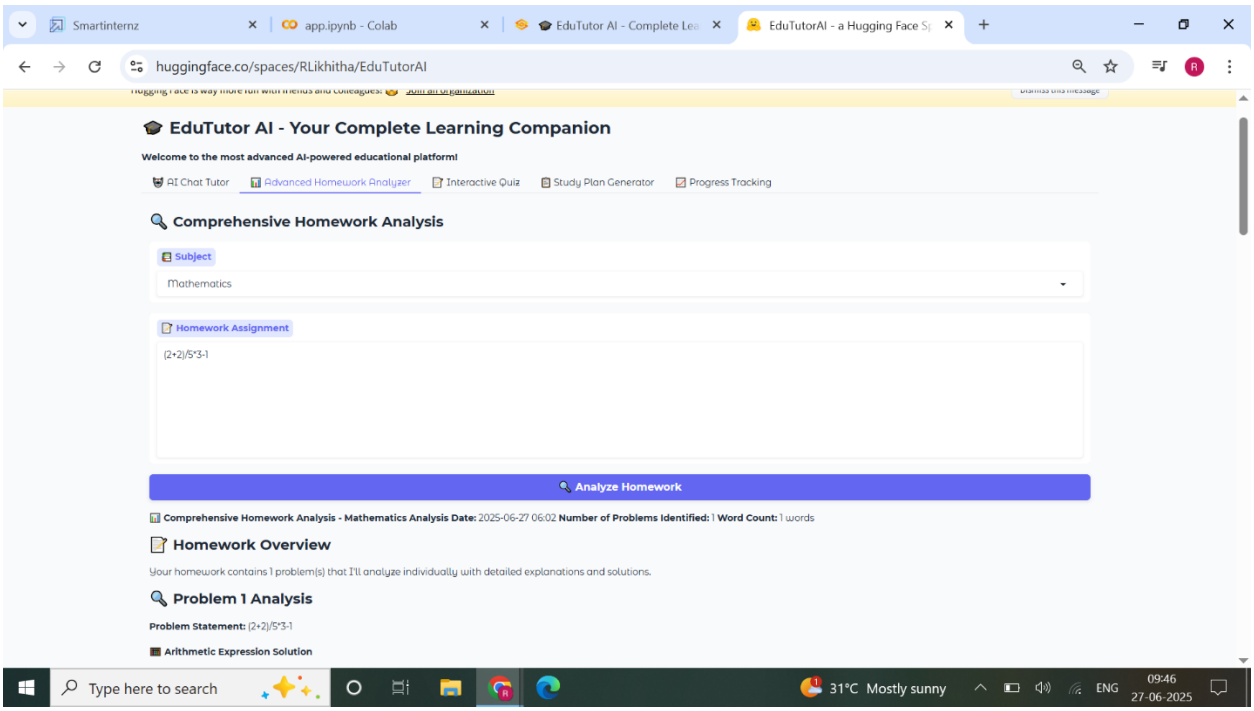
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EduTutor AI - Your Complete Learning Companion
Welcome to the most advanced AI-powered educational platform!
AI Chat Tutor
Advanced Homework Analyzer
Interactive Quiz
Study Plan Generator
Progress Tracking
Comprehensive Homework Analysis
Subject
Mathematics
Homework Assignment
(2+2)/5*3-1
Analyze Homework
Comprehensive Homework Analysis - Mathematics Analysis Date: 2025-06-27 06:02 Number of Problems Identified: 1 Word Count: 1 words
Homework Overview
Your homework contains 1 problem(s) that I'll analyze individually with detailed explanations and solutions.
Problem 1 Analysis
Problem Statement: (2+2)/5*3-1
Arithmetic Expression Solution
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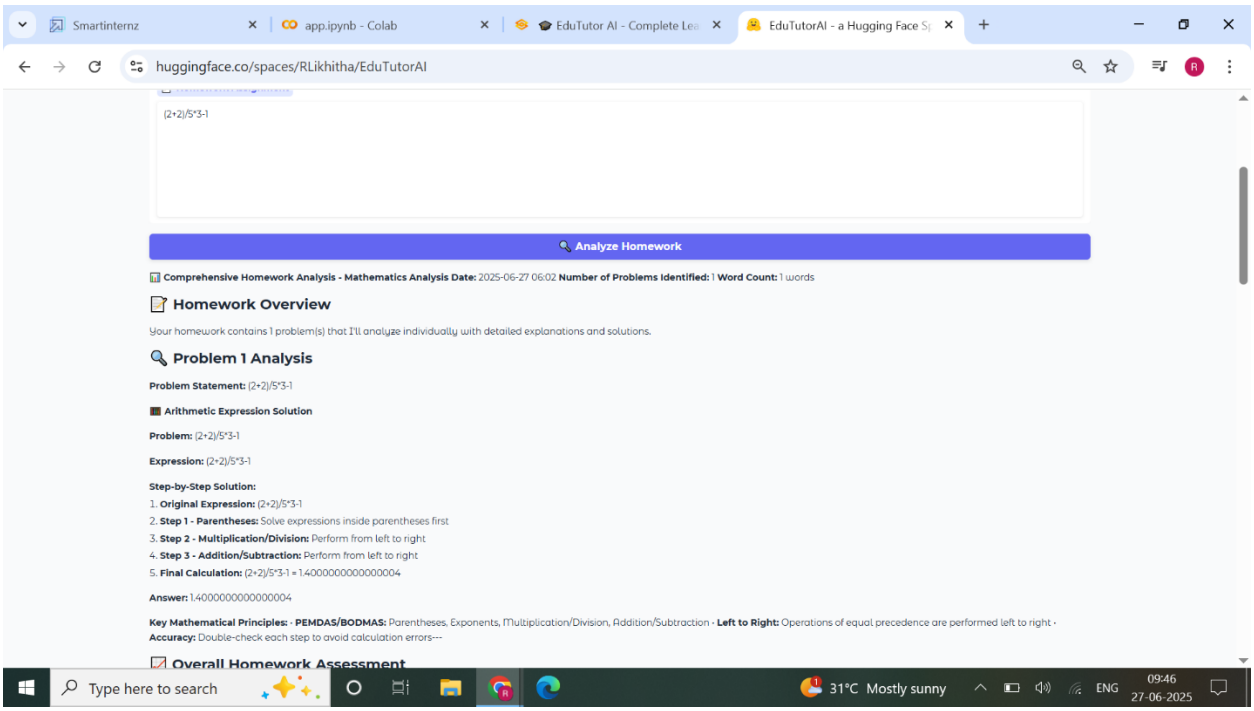
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(2+2)/5*3-1
Analyze Homework
Comprehensive Homework Analysis - Mathematics Analysis Date: 2025-06-27 06:02 Number of Problems Identified: 1 Word Count: 1 words
Homework Overview
Your homework contains 1 problem(s) that I'll analyze individually with detailed explanations and solutions.
Problem 1 Analysis
Problem Statement: (2+2)/5*3-1
Arithmetic Expression Solution
Problem: (2+2)/5*3-1
Expression: (2+2)/5*3-1
Step-by-Step Solution:
1. Original Expression: (2+2)/5*3-1
2. Step 1 - Parentheses: Solve expressions inside parentheses first
3. Step 2 - Multiplication/Division: Perform from left to right
4. Step 3 - Addition/Subtraction: Perform from left to right
5. Final Calculation: (2+2)/5*3-1 = 1.4000000000000004
Answer: 1.4000000000000004
Key Mathematical Principles: · PEMDAS/BODMAS: Parentheses, Exponents, Multiplication/Division, Addition/Subtraction · Left to Right: Operations of equal precedence are performed left to right · Accuracy: Double-check each step to avoid calculation errors---
Overall Homework Assessment
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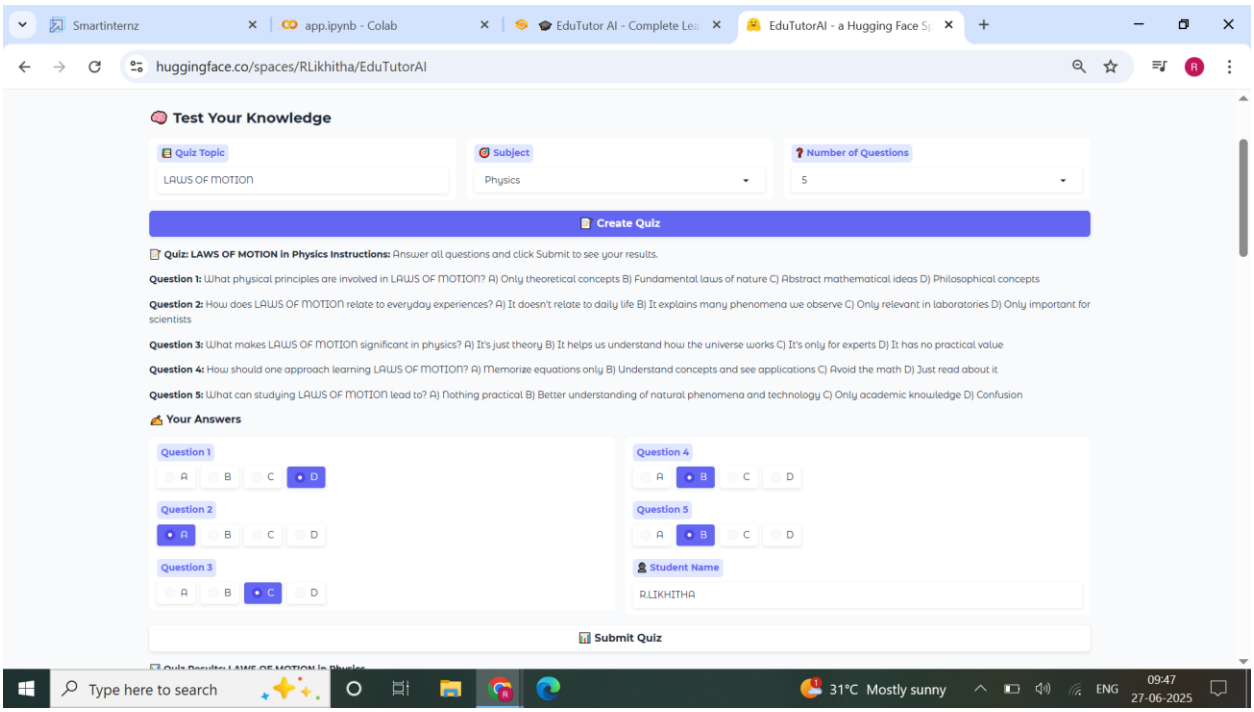
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Test Your Knowledge
Quiz Topic
LAWS OF MOTION
Subject
Physics
Number of Questions
5
Create Quiz
Quiz: LAWS OF MOTION in Physics Instructions: Answer all questions and click Submit to see your results.
Question 1: What physical principles are involved in LAWS OF MOTION? A) Only theoretical concepts B) Fundamental laws of nature C) Abstract mathematical ideas D) Philosophical concepts
Question 2: How does LAWS OF MOTION relate to everyday experiences? A) It doesn't relate to daily life B) It explains many phenomena we observe C) Only relevant in laboratories D) Only important for scientists
Question 3: What makes LAWS OF MOTION significant in physics? A) It's just theory B) It helps us understand how the universe works C) It's only for experts D) It has no practical value
Question 4: How should one approach learning LAWS OF MOTION? A) Memorize equations only B) Understand concepts and see applications C) Avoid the math D) Just read about it
Question 5: What can studying LAWS OF MOTION lead to? A) Nothing practical B) Better understanding of natural phenomena and technology C) Only academic knowledge D) Confusion
Your Answers
Question 1
Question 2
Question 3
Question 4
Question 5
Student Name
R.LIKHITHA
Submit Quiz
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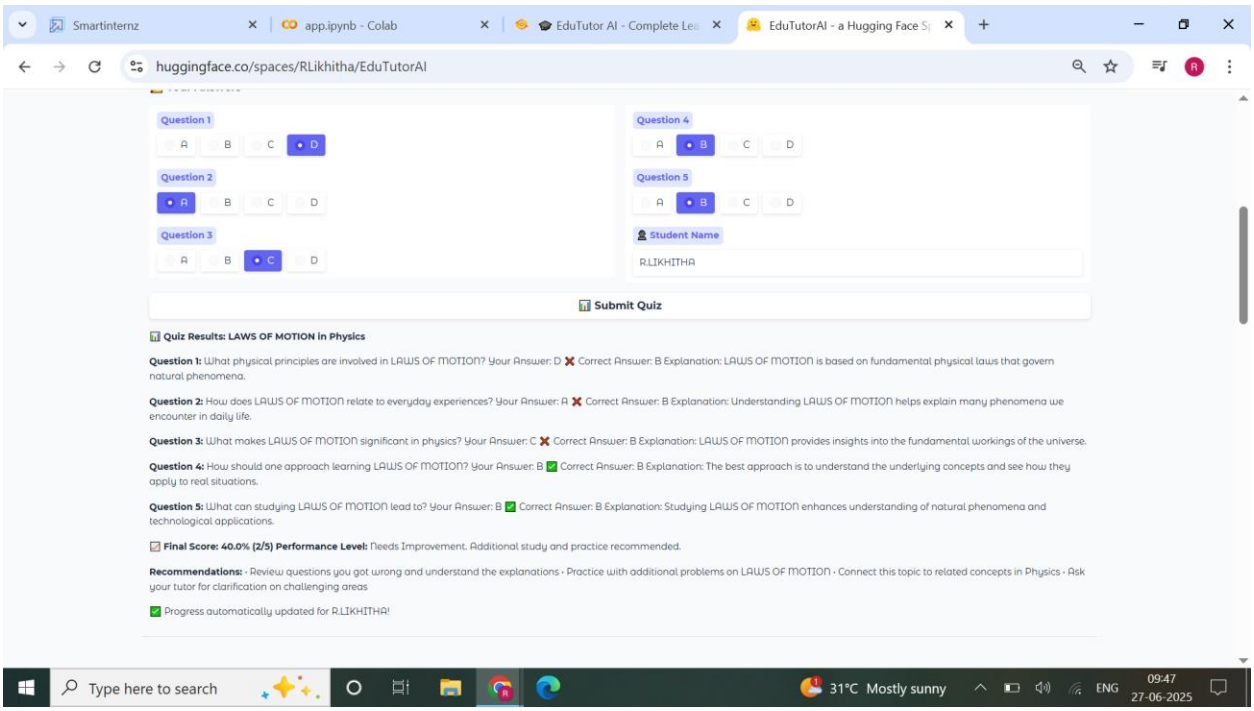
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Question 1
A B C D
Question 2
A B C D
Question 3
A B C D
Question 4
A B C D
Question 5
A B C D
Student Name
R.LIKHITHA
Submit Quiz
Quiz Results: LAWS OF MOTION in Physics
Question 1: What physical principles are involved in LAWS OF MOTION? Your Answer: D ✗ Correct Answer: B Explanation: LAWS OF MOTION is based on fundamental physical laws that govern natural phenomena.
Question 2: How does LAWS OF MOTION relate to everyday experiences? Your Answer: A ✗ Correct Answer: B Explanation: Understanding LAWS OF MOTION helps explain many phenomena we encounter in daily life.
Question 3: What makes LAWS OF MOTION significant in physics? Your Answer: C ✗ Correct Answer: B Explanation: LAWS OF MOTION provides insights into the fundamental workings of the universe.
Question 4: How should one approach learning LAWS OF MOTION? Your Answer: B ✓ Correct Answer: B Explanation: The best approach is to understand the underlying concepts and see how they apply to real situations.
Question 5: What can studying LAWS OF MOTION lead to? Your Answer: B ✓ Correct Answer: B Explanation: Studying LAWS OF MOTION enhances understanding of natural phenomena and technological applications.
Final Score: 40.0% (2/5) Performance Level: Needs Improvement. Additional study and practice recommended.
Recommendations: · Review questions you got wrong and understand the explanations · Practice with additional problems on LAWS OF MOTION · Connect this topic to related concepts in Physics · Ask your tutor for clarification on challenging areas
Progress automatically updated for R.LIKHITHA!
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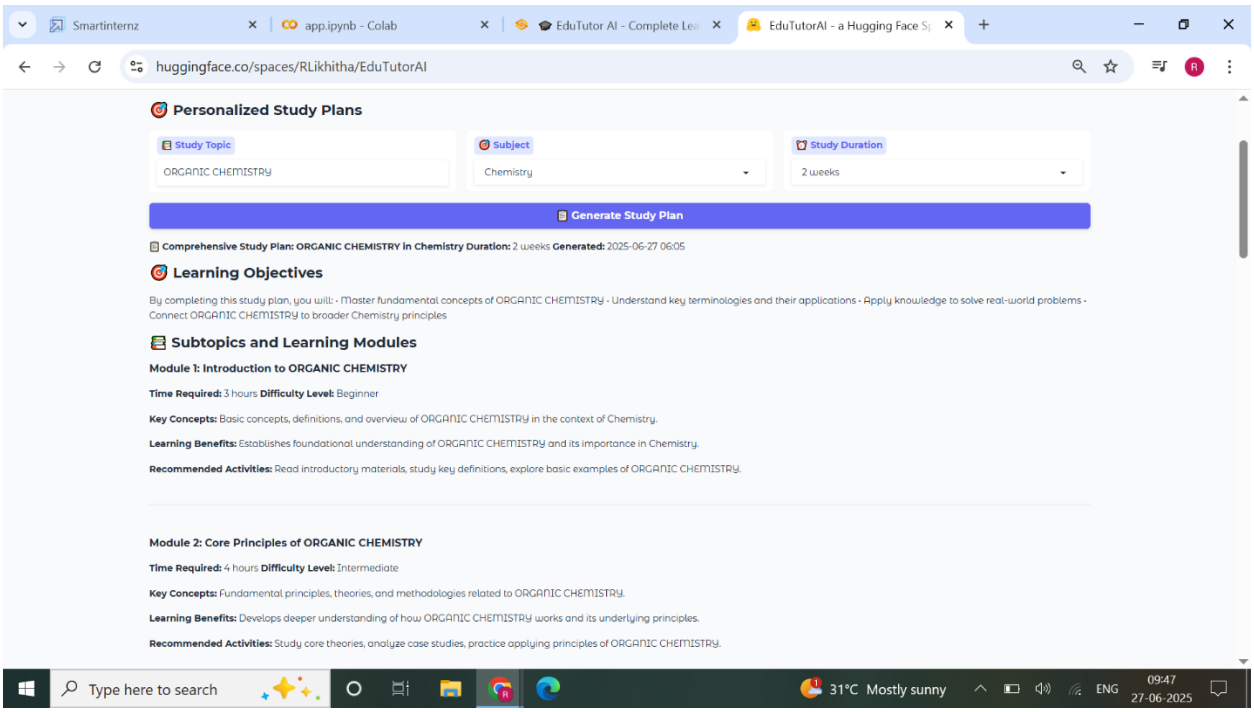
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Personalized Study Plans
Study Topic
ORGANIC CHEMISTRY
Subject
Chemistry
Study Duration
2 weeks
Generate Study Plan
Comprehensive Study Plan: ORGANIC CHEMISTRY in Chemistry Duration: 2 weeks Generated: 2025-06-27 06:05
Learning Objectives
By completing this study plan, you will: · Master fundamental concepts of ORGANIC CHEMISTRY · Understand key terminologies and their applications · Apply knowledge to solve real-world problems · Connect ORGANIC CHEMISTRY to broader Chemistry principles
Subtopics and Learning Modules
Module 1: Introduction to ORGANIC CHEMISTRY
Time Required: 3 hours Difficulty Level: Beginner
Key Concepts: Basic concepts, definitions, and overview of ORGANIC CHEMISTRY in the context of Chemistry.
Learning Benefits: Establishes foundational understanding of ORGANIC CHEMISTRY and its importance in Chemistry.
Recommended Activities: Read introductory materials, study key definitions, explore basic examples of ORGANIC CHEMISTRY.
Module 2: Core Principles of ORGANIC CHEMISTRY
Time Required: 4 hours Difficulty Level: Intermediate
Key Concepts: Fundamental principles, theories, and methodologies related to ORGANIC CHEMISTRY.
Learning Benefits: Develops deeper understanding of how ORGANIC CHEMISTRY works and its underlying principles.
Recommended Activities: Study core theories, analyze case studies, practice applying principles of ORGANIC CHEMISTRY.
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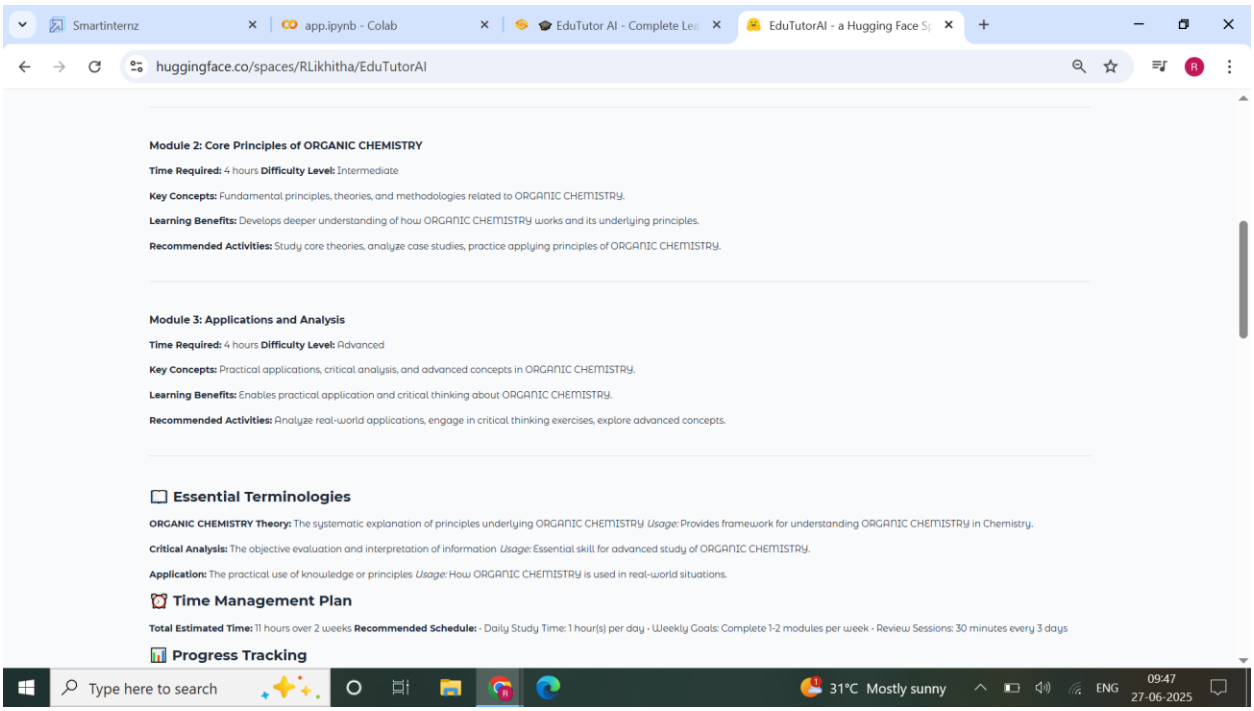
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huggingface.co/spaces/RLikhitha/EduTutorAI
Module 2: Core Principles of ORGANIC CHEMISTRY
Time Required: 4 hours Difficulty Level: Intermediate
Key Concepts: Fundamental principles, theories, and methodologies related to ORGANIC CHEMISTRY.
Learning Benefits: Develops deeper understanding of how ORGANIC CHEMISTRY works and its underlying principles.
Recommended Activities: Study core theories, analyze case studies, practice applying principles of ORGANIC CHEMISTRY.
Module 3: Applications and Analysis
Time Required: 4 hours Difficulty Level: Advanced
Key Concepts: Practical applications, critical analysis, and advanced concepts in ORGANIC CHEMISTRY.
Learning Benefits: Enables practical application and critical thinking about ORGANIC CHEMISTRY.
Recommended Activities: Analyze real-world applications, engage in critical thinking exercises, explore advanced concepts.
Essential Terminologies
ORGANIC CHEMISTRY Theory: The systematic explanation of principles underlying ORGANIC CHEMISTRY Usage: Provides framework for understanding ORGANIC CHEMISTRY in Chemistry.
Critical Analysis: The objective evaluation and interpretation of information Usage: Essential skill for advanced study of ORGANIC CHEMISTRY.
Application: The practical use of knowledge or principles Usage: How ORGANIC CHEMISTRY is used in real-world situations.
Time Management Plan
Total Estimated Time: 11 hours over 2 weeks Recommended Schedule: - Daily Study Time: 1 hour(s) per day - Weekly Goals: Complete 1-2 modules per week - Review Sessions: 30 minutes every 3 days
Progress Tracking
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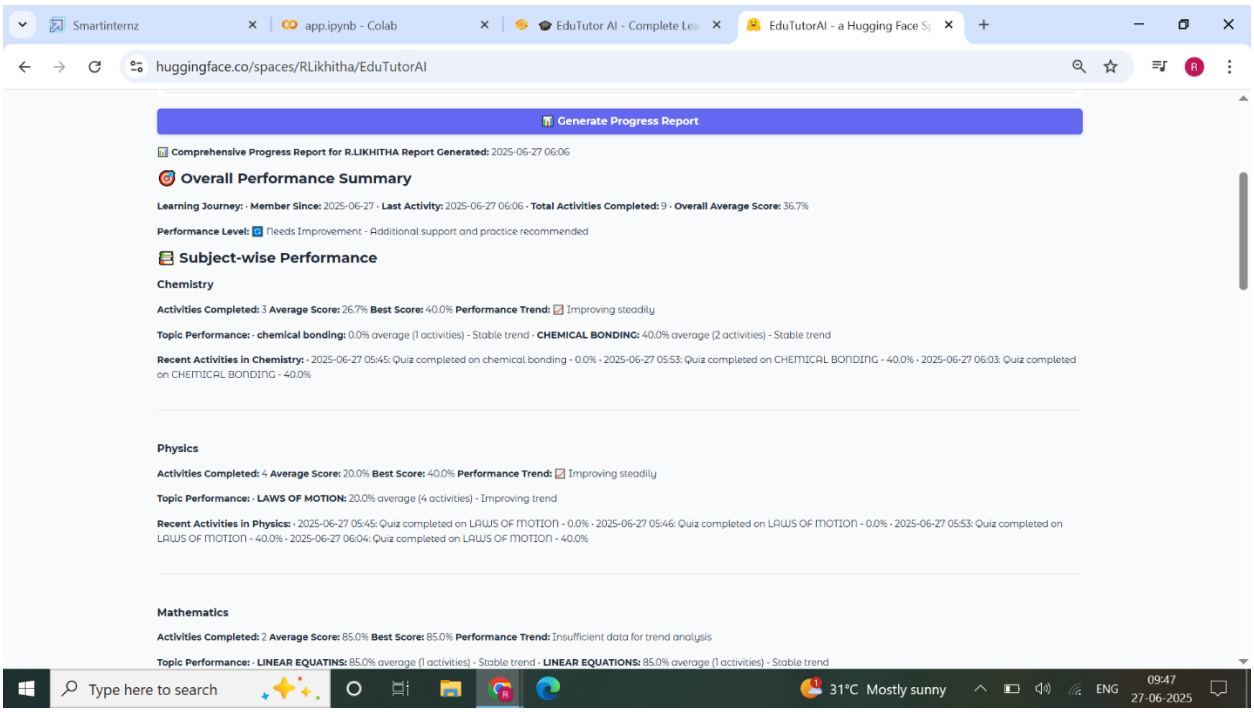
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Generate Progress Report
Comprehensive Progress Report for R.LIKHITHA Report Generated: 2025-06-27 06:06
Overall Performance Summary
Learning Journey: · Member Since: 2025-06-27 · Last Activity: 2025-06-27 06:06 · Total Activities Completed: 9 · Overall Average Score: 36.7%
Performance Level: Needs Improvement - Additional support and practice recommended
Subject-wise Performance
Chemistry
Activities Completed: 3 Average Score: 26.7% Best Score: 40.0% Performance Trend: Improving steadily
Topic Performance: · chemical bonding: 0.0% average (1 activities) - Stable trend · CHEMICAL BONDING: 40.0% average (2 activities) - Stable trend
Recent Activities in Chemistry: · 2025-06-27 05:45: Quiz completed on chemical bonding - 0.0% · 2025-06-27 05:53: Quiz completed on CHEMICAL BONDING - 40.0% · 2025-06-27 06:03: Quiz completed on CHEMICAL BONDING - 40.0%
Physics
Activities Completed: 4 Average Score: 20.0% Best Score: 40.0% Performance Trend: Improving steadily
Topic Performance: · LAWS OF MOTION: 20.0% average (4 activities) - Improving trend
Recent Activities in Physics: · 2025-06-27 05:45: Quiz completed on LAWS OF MOTION - 0.0% · 2025-06-27 05:46: Quiz completed on LAWS OF MOTION - 0.0% · 2025-06-27 05:53: Quiz completed on LAWS OF MOTION - 40.0% · 2025-06-27 06:04: Quiz completed on LAWS OF MOTION - 40.0%
Mathematics
Activities Completed: 2 Average Score: 85.0% Best Score: 85.0% Performance Trend: Insufficient data for trend analysis
Topic Performance: · LINEAR EQUATINS: 85.0% average (1 activities) - Stable trend · LINEAR EQUATIONS: 85.0% average (1 activities) - Stable trend
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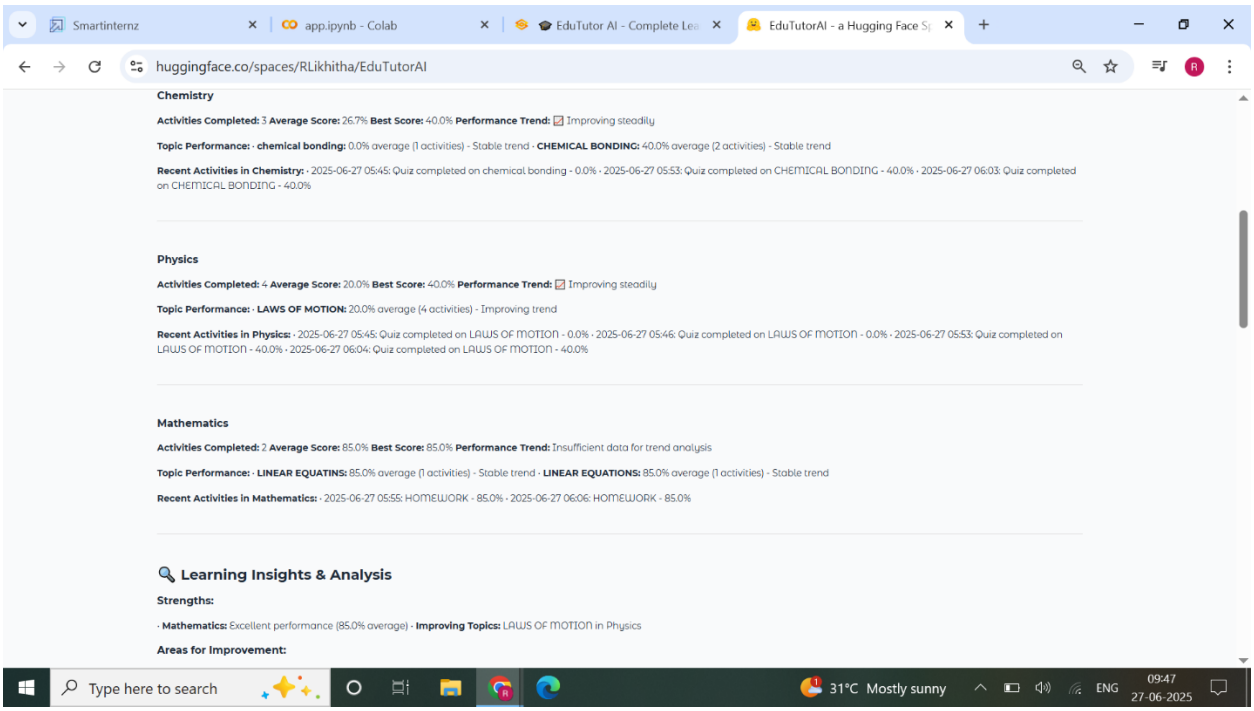

Demo:

https://drive.google.com/file/d/1FrinFD1BzFGOfm1vvS-ci-rYHcQNP_Aq/view?usp=sharing

12. Known Issues

- Whisper model accuracy drops in noisy environments
- Initial LMS plugin setup is manual
- Limited GPU availability on free-tier hosting

13. Future Enhancements

- Multilingual AI translation layer
- Avatar-based AI video tutor
- Blockchain-based certification validation
- Gamification layer (XP, badges)
- Wearable integration for focus tracking