

Edu Tutor - Project Documentation

1. Introduction

- Project Title: Edu Tutor AI: Personalized learning with generative AI and LMS integration

- Team Leader: Swetha R
- Team Member: Shalini M
- Team Member: Shalini R
 - Team Member: Sasi Priya M
 - Team Member: Sharmila V

2. Project Overview

- Purpose:

The purpose of Edu Tutor is to provide students with an AI-powered learning assistant that explains academic concepts in simple language, generates quizzes for practice, and offers personalized learning support. By leveraging AI and real-time data, Edu Tutor acts as a virtual tutor, helping learners across different subjects with interactive explanations, practice exercises, and progress tracking.

Features:

- Conversational Interface (natural language learning support)
- Concept Explanation (simplified subject understanding)
- Quiz Generator (MCQs, true/false, short answer practice)
- Personalized Learning Path (adaptive content suggestions)
- Progress Tracking (student performance monitoring)
- Resource Recommendations (study materials and references)
- Multimodal Input Support (text, PDFs, images for analysis)
- Gradio/Streamlit UI (user-friendly interface for students and teachers)

3. Architecture

Frontend: Streamlit or Gradio-based interactive dashboard with pages for explanations, quizzes, and student progress tracking.

Backend: FastAPI backend powering concept explanations, quiz generation, and student progress APIs.

LLM Integration: IBM Watsonx Granite or Hugging Face models for natural language processing.

Database: Stores user performance, quiz results, and progress history.

ML Modules: Adaptive learning engine recommending topics based on student weaknesses.

4. Setup Instructions

Prerequisites:

- o Python 3.9 or later

- o pip and virtual environment tools
- o API keys for LLM service
- o Internet access

Installation Process:

- o Clone the repository
- o Install dependencies from requirements.txt
- o Configure API keys in .env
- o Run FastAPI backend
- o Launch frontend via Streamlit/Gradio
- o Start interacting with Edu Tutor

5. Folder Structure

- app/ - Contains backend logic including routers, models, and integration modules.
- app/api/ - Subdirectory for modular API routes like quiz, explanation, and tracking.
- ui/ - Contains frontend components for pages and layouts.
- edu_dashboard.py - Entry script for launching the main dashboard.
- llm_integration.py - Handles communication with LLMs.
- quiz_generator.py - Creates quizzes for given topics.
- progress_tracker.py - Tracks and visualizes student learning progress.

6. Running the Application

- Launch the FastAPI server to expose backend endpoints.
- Run the Streamlit/Gradio dashboard.
- Navigate through tabs for concept explanation, quiz generation, and progress tracking.
- Upload study materials if needed.
- Receive real-time explanations, quizzes, and personalized learning suggestions.

7. API Documentation

- POST /explain - Provides AI-generated explanation of a concept
- POST /generate-quiz - Generates quizzes for a given subject
- GET /track-progress - Returns student learning progress
- POST /upload-material - Uploads documents for analysis
- POST /feedback - Stores student/teacher feedback

8. Authentication

Edu Tutor supports secure deployment with:

- Token-based authentication (JWT/API keys)
- OAuth2 integration for teachers and admins
- Role-based access (student, teacher, admin)
- Session history for personalized experiences

9. User Interface

The Edu Tutor interface is designed to be simple and engaging for students. It includes tabbed layouts for explanations, quizzes, and progress tracking. The UI also supports PDF report downloads, progress charts, and adaptive suggestions.

10. Testing

Testing includes:

- Unit Testing: For quiz generation and explanation functions
- API Testing: Via Swagger UI/Postman
- Manual Testing: For quiz responses, explanations, and progress tracking
- Edge Case Handling: Invalid queries, large documents, unexpected inputs

Edu Tutor was validated to ensure reliability for students and educators.

11. Project Screenshots

EduTutor AI Login

Username

Password

Login

Login Status

Feedback

Feedback Center

Feedback

Educational AI Assistant

Concept Explanation | Question Generator

Enter a concept

Explain

Explanation

Feedback

Feedback Center

Feedback

Educational AI Assistant

Concept Explanation

Quiz Generator

Enter a topic

Computers

Generate Quiz

Quiz Questions

Answer 1

1. Web browsing

2. True

3. Hardware fault: A diagnostic tool that can pinpoint hardware patterns and errors in a network topology or data within a device, making it a primary tool for network administrators to troubleshoot and resolve hardware issues, ensuring faster problem-solving, higher reliability, and lower power consumption.

4. A RAM (Random Access Memory) extension that allows operating systems to compensate for insufficient RAM.

5. False

The BIOS (Basic Input/Output System) is a critical component of a computer's hardware, responsible for initializing hardware components during boot-up. These jobs have been understood by BIOS.

Verifying and initializing essential system hardware components at startup.

Managing the boot loader (e.g., GRUB) and the operating system (e.g., Windows, Linux, macOS).

Implementing basic input/output (I/O) systems, such as a hard disk, and device communication protocols.

Providing a user interface (e.g., BIOS setup) for configuring and adjusting system settings.

Educational AI Assistant

Login

Concept Explanation

Quiz Generator

Enter a topic

Bus

Generate Quiz

Quiz Questions

1. Which is not a bus?

A. System bus

B. Ethernet

C. USB

D. Display

2. Which is not a bus?

A. System bus

B. Ethernet

C. USB

D. Display

3. Which is not a bus?

A. System bus

B. Ethernet

C. USB

D. Display

Educational AI Assistant

Login

Concept Explanation

Quiz Generator

Enter a concept

exit

Explain

Explanation

Birdy Stage: Birds have a complex daily routine, starting with waking up, stretching their excellent beaks, and preening their feathers. They mate socially in flocks and communicate using distinct songs and various patterns, such as trills, whistles, and chirps. Many birds exhibit intricate nesting behaviors, including digging, building, and weaving elaborate nests, as well as the ability to lay patterns on their eggs. They have keen eyesight, which helps them find food sources, allowing them to select food items precisely from afar.

Fall: Along flexible daily routines and communication.

2. Behavior and Personality

Birds possess a wide range of their independent streaks, preferring to spend time alone despite their communal nature. Not all birds conform to social structures. Despite their independent nature, they can be highly social, often forming flocks that play the role through genetic, health, and learning. Affectionate expressions, such as communal roosting, often go hand-in-hand with the social grooming of the neck, preening the neck, and preening. Affectionate games, like happy playing chase games, which help maintain physical fitness. Socialization, such as communal roosting, is a common form of social interaction, including messages, preening, and other socializing behaviors. Many birds exhibit a unique personality, often displaying a mix of behaviors and traits that contribute to their unique personality and social interactions.

3. Eating and Feeding Habits

Birds are omnivorous, primarily feeding on a diet consisting of insects, although some may consume only meat or only eat vegetables. Many birds are highly skilled at catching insects, especially those that fly quickly and are difficult to catch. Some birds are highly skilled at catching insects, especially those that fly quickly and are difficult to catch. Some birds are highly skilled at catching insects, especially those that fly quickly and are difficult to catch. Some birds are highly skilled at catching insects, especially those that fly quickly and are difficult to catch.

Explain this concept

Educational AI Assistant

Login

Concept Explanation

Quiz Generator

Enter a topic

Computer

Generate Quiz

Quiz Questions

1. Which of the following is a common method for data storage in a computer system?
1. Web browser
2. CPU
3. RAM
4. Hard drive
5. SSD
6. Network interface card
7. Motherboard
8. Power supply
9. Operating system
10. BIOS
11. GPU
12. Network interface card
13. Motherboard
14. Power supply
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13. Future Enhancements

- Improve scalability to support higher student traffic with minimal latency.
- Enhance the adaptive learning engine with deeper personalization using student analytics.
- Integrate voice-based interaction for better accessibility.
- Add gamification features such as leaderboards and reward points for students.
- Enable multilingual support for broader student engagement.
- Expand support for more file types including PPT, video lectures, and audio materials.

12. Issues Faced in the Project

- Integration challenges with third-party APIs and LLM models caused occasional delays in responses.
- Handling large document uploads led to performance bottlenecks during testing.
- Some UI/UX adjustments were required to improve navigation for first-time users.
- Quiz generation sometimes provided repetitive or low-difficulty questions.
- Authentication required additional fine-tuning for role-based access.