EduTutor AI: Personalized Learning with Generative AI and LMS Integration

Project Documentation

1. Introduction

- **Project Title: EduTutor AI: Personalized Learning with Generative AI and LMS Integration**
- **Team Members:**
  - **Member 1: SUJITHKUMAR G**
  - **Member 2: SARAVANAKUMAR S**
  - **Member 3: INTHIRAKUMAR K**
  - **Member 4: GUNALAN J**

Introduction:
Learning is often limited by access to good teachers, study resources, and interactive tools. Students frequently struggle with complex concepts and lack engaging quizzes for revision.

The **Educational AI Assistant** leverages **Natural Language Processing (NLP)** and **Large Language Models (LLMs)** to provide:

1. **Detailed explanations of concepts with examples.**
2. **AI-generated quizzes with answers** to test knowledge retention.

This project supports **self-paced learning, exam preparation, and teacher assistance**.

2. Project Overview

Purpose:

- Make learning interactive and AI-driven.
- Provide instant explanations and practice material.
- Reduce dependency on static textbooks by generating customized learning content.

Objectives:

1. Deliver **detailed explanations** of academic and technical concepts.
2. Generate **quizzes with diverse question types**.
3. Support **students, teachers, and self-learners**.
4. Provide a **user-friendly web application** accessible anywhere.

Features:

1. **Concept Explanation**

- Input: Concept name (e.g., *Machine Learning*).
- Output: Clear, structured explanation with examples.

2. **Quiz Generator**
   - Input: Topic (e.g., *Physics*).
   - Output: 5 quiz questions (MCQ, True/False, Short Answer) with an **ANSWER section**.
3. **Gradio Web UI**
   - Tab-based interface for easy navigation.
   - Works in **Google Colab or local environments**.

3. Architecture

- **Frontend (Gradio):**
  - Interactive UI with two tabs: *Concept Explanation* and *Quiz Generator*.
  - Provides real-time responses.
- **Backend (Transformers + PyTorch):**
  - Model: **ibm-granite/granite-3.2-2b-instruct**.
  - Handles NLP tasks for concept explanation and quiz generation.
- **Core Functions:**
  - generate_response() – Runs model inference.
  - concept_explanation() – Provides detailed explanations.
  - quiz_generator() – Creates quizzes with answers.
- **Data Flow:**

1. User input →
2. Tokenization →
3. Model inference →
4. Post-processing →
5. Display output in Gradio UI.

4. Setup Instructions

Prerequisites:

- Python 3.9+

- Libraries:
- pip install gradio torch transformers

Installation Steps:

1. Open Google Colab / local Python environment.
2. Paste the project code.
3. Run the script.
4. Gradio will provide a **shareable link**.

5. Folder Structure

educational-ai-assistant/

├── app.ipynb # Colab notebook

├── requirements.txt # Dependency list

├── README.md # Documentation

6. Running the Application

1. Run the notebook/script.
2. Open Gradio link.
3. Use:
    - **Concept Explanation Tab:** Input concept → AI explanation.
    - **Quiz Generator Tab:** Input topic → AI quiz with answers.

7. API Documentation (Internal Functions)

- **generate_response(prompt, max_length)**
    - Input: Prompt string.
    - Output: AI-generated text.
- **concept_explanation(concept)**
    - Input: Concept (string).
    - Output: Detailed explanation with examples.
- **quiz_generator(concept)**
    - Input: Topic (string).

    - Output: Quiz (5 questions with answers).

8. Authentication

- Current version: Open access.
- Planned features:
    - User login for personalized learning.
    - Role-based access (students, teachers).

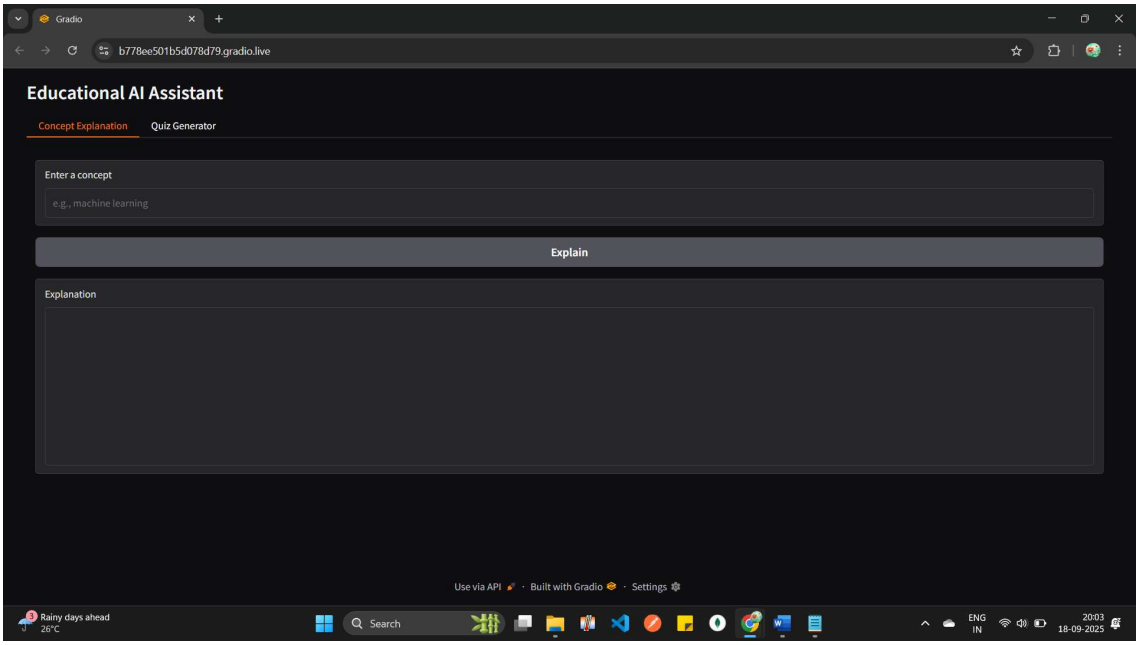
9. User Interface

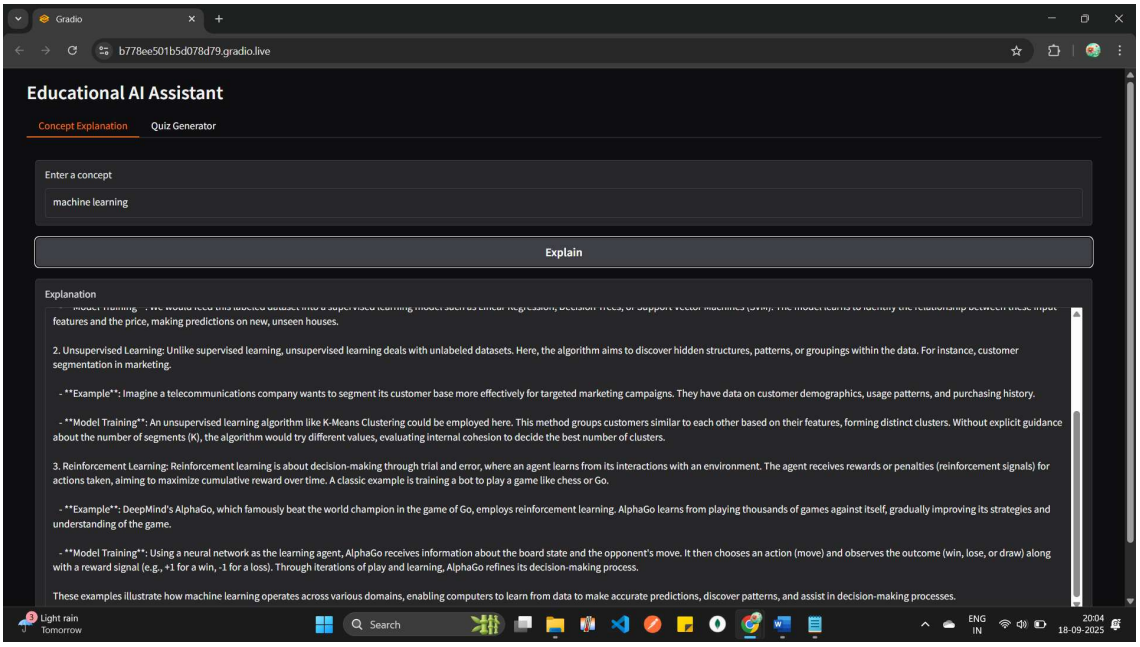
- **Tabs:** Concept Explanation, Quiz Generator.
- **Inputs:** Concept/topic text.
- **Outputs:**
    - Detailed explanation (text).
    - Quiz questions with answers.

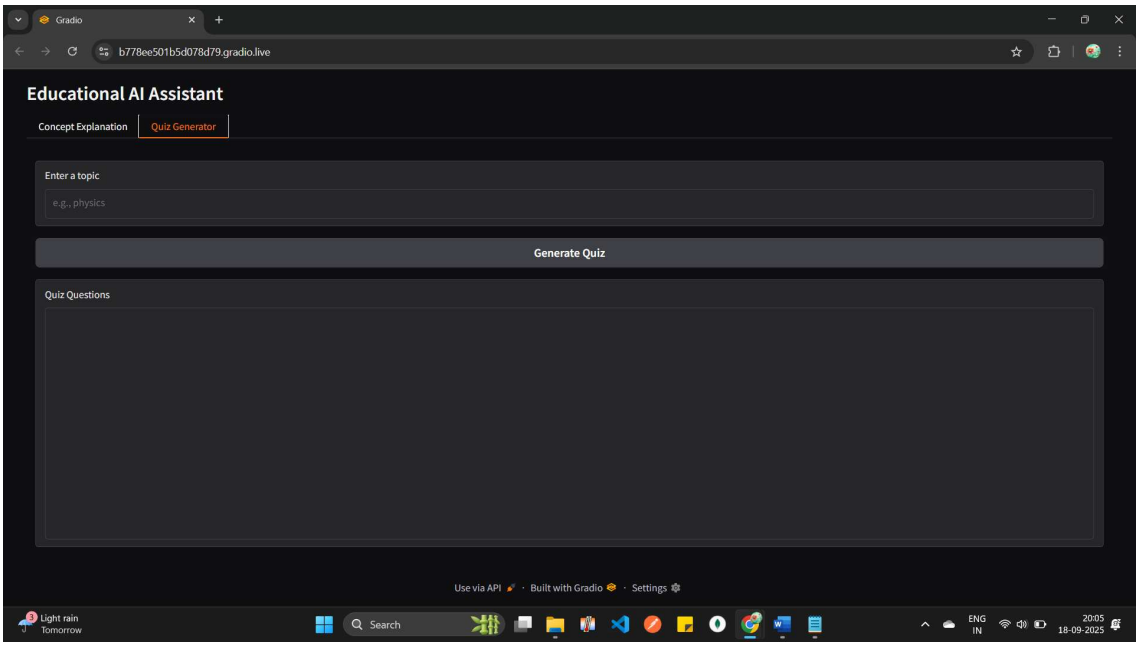
10. Testing

- **Unit Testing:** Validate responses for different inputs.
- **Manual Testing:** Verify quiz formats and answer correctness.
- **Edge Cases:**
    - Empty input.
    - Rare/unfamiliar topics.

11. Screenshots






Gradio
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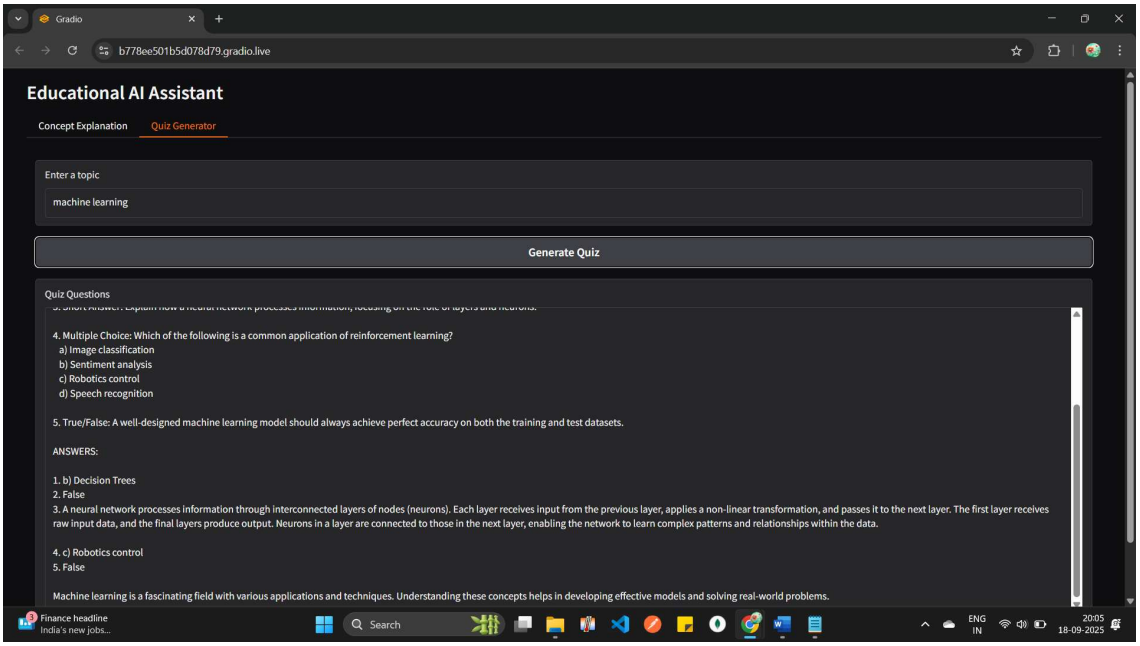
Educational AI Assistant
Concept Explanation
Quiz Generator
Enter a topic
e.g., physics
Generate Quiz
Quiz Questions
Use via API · Built with Gradio · Settings
Light rain
Tomorrow
Search
ENG
IN
20:05
18-09-2025


Gradio
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Educational AI Assistant
Concept Explanation
Quiz Generator
Enter a topic
machine learning
Generate Quiz
Quiz Questions
4. Multiple Choice: Which of the following is a common application of reinforcement learning?
a) Image classification
b) Sentiment analysis
c) Robotics control
d) Speech recognition
5. True/False: A well-designed machine learning model should always achieve perfect accuracy on both the training and test datasets.
ANSWERS:
1. b) Decision Trees
2. False
3. A neural network processes information through interconnected layers of nodes (neurons). Each layer receives input from the previous layer, applies a non-linear transformation, and passes it to the next layer. The first layer receives raw input data, and the final layers produce output. Neurons in a layer are connected to those in the next layer, enabling the network to learn complex patterns and relationships within the data.
4. c) Robotics control
5. False
Machine learning is a fascinating field with various applications and techniques. Understanding these concepts helps in developing effective models and solving real-world problems.
Finance headline
India's new jobs...
Search
ENG
IN
20:05
18-09-2025

12. Known Issues

- Explanations may vary in depth depending on the topic.
- Quizzes sometimes generate **repetitive or generic questions**.
- Model may provide answers that differ slightly from standard references.

13. Future Enhancements

1. Add **adaptive learning** – quizzes tailored to student's level.
2. Support for **STEM diagrams and math problems**.
3. Provide **export to PDF/Word** for quiz papers.
4. Integrate with **Learning Management Systems (LMS)**.
5. Add **voice input/output** for accessibility.

14. Educational Use Cases

- **Students:** Self-learning and exam preparation.
- **Teachers:** Generate quiz papers instantly.
- **Tutors:** Provide AI-based supplementary explanations.
- **E-learning Platforms:** Enhance interactivity.

15. Societal Impact

- Promotes **democratized access to education**.
- Reduces dependence on paid resources.
- Supports **lifelong learning** beyond classrooms.
- Bridges gap for students in rural/remote areas.

16. Limitations

- Not a substitute for **teachers or formal education**.
- Explanations may vary in depth across disciplines.
- No multimedia (diagrams, audio) in current version