PROJECT REPORT

Edu Tutor AI: Personalized Learning

YEAR : **2025 – 2026**

COLLEGE NAME : K.C.S KASI NADAR COLLEGE OF ARTS & SCIENCE

CODE : UNM203

DEPARTMENT : **COMPUTER SCIENCE**

PROGRAM : **B.C.A**

SEMESTER **V**

PROJECT SUBMITTED TO: UNIVERSITY OF MADRAS / NAAN MUDALVAN

Course Name : **Generative AI with IBM**

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MEMBERS:

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EduTutor AI – Personalized Learning with IBM Granite

Introduction :

Education is evolving rapidly in the digital era. Traditional learning methods often fail to address the individual pace, style, and needs of students. Learners today need personalized, interactive, and engaging platforms to improve retention and understanding.

EduTutor AI is designed as a personalized learning assistant, powered by AI models (IBM Granite / Hugging Face). It allows students to ask any concept, receive detailed explanations, and generate practice quizzes instantly.

This project combines the power of React.js for frontend, Gradio for AI interaction, and Python with Transformers for backend AI tasks. It bridges the gap between static learning resources and dynamic, AI-driven tutoring, making education more accessible, adaptive, and enjoyable.

Objectives :

- To build an AI-powered platform that assists students in learning concepts more effectively.
- To integrate Concept Explanation and Quiz Generation modules for better practice.
- To create a simple login system for authentication before accessing features.
- To design a user-friendly UI with responsive design.
- To demonstrate the usage of IBM Granite models and Hugging Face for educational AI.
- To provide a scalable foundation for future integration into LMS platforms.

System Analysis:

Existing System

- Traditional e-learning platforms are static and rely on pre-prepared content.
- Limited interactivity and no personalization.
- Students often struggle to get quick explanations for specific doubts.
- Quizzes are fixed and don’t adapt to the learner’s input.

Proposed System

EduTutor AI overcomes these limitations by providing:

- AI-driven concept explanation.

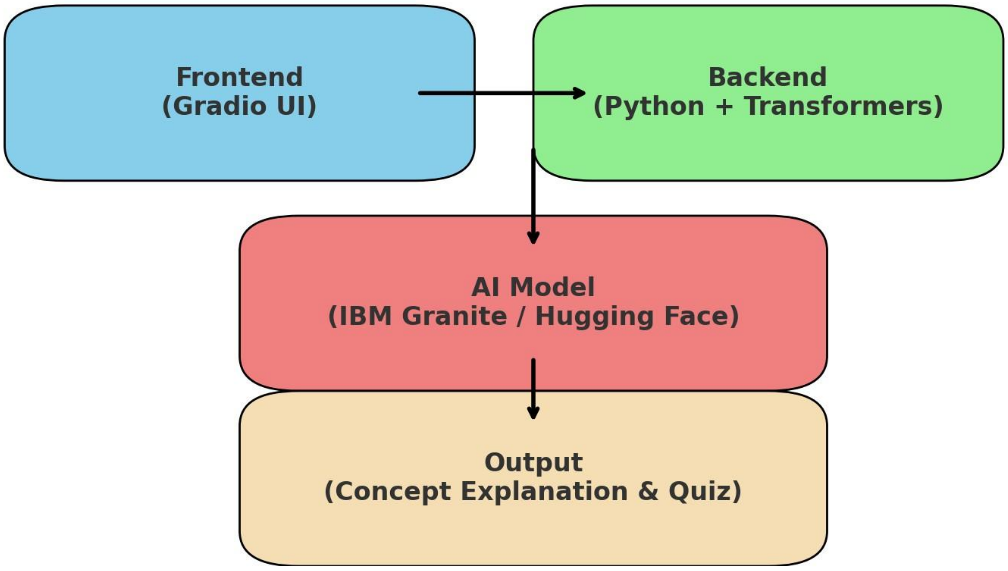
- Instant quiz generation for practice.
- Interactive UI built with React.js and Gradio.
- A basic authentication system.
- Scalability for future AI enhancements.

Advantages

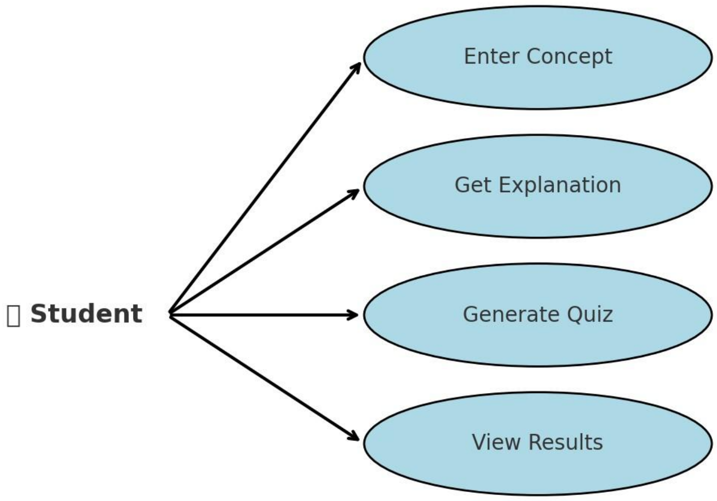
- Personalized learning experience.
- Real-time AI responses.
- Easy accessibility on browser.
- Lightweight and scalable architecture.

System Design:

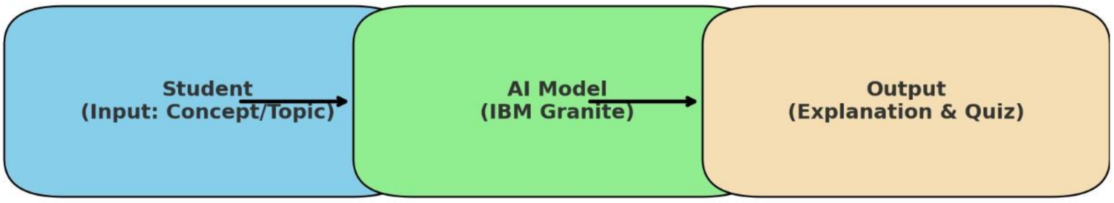
Architecture Diagram



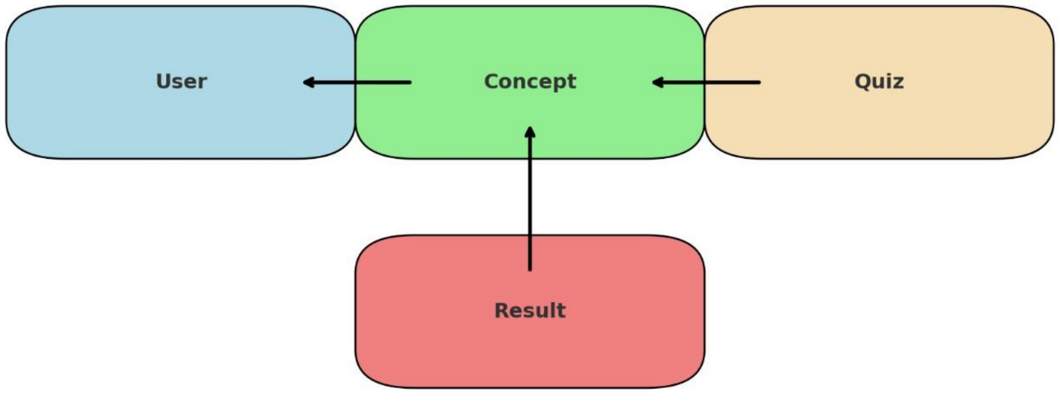
Use Case Diagram:



Data Flow Diagram



ER Diagram



Modules:

1. Concept Explanation Module

- User types a concept (e.g., *Photosynthesis*, *Federalism*).
- AI model generates a **clear, structured explanation** with examples.
- Helps learners understand topics instantly without external search.

2. Quiz Generator Module

- User enters a topic (e.g., *Biomolecules*).
- AI generates quizzes in different formats:

  o Multiple Choice Questions

  (MCQ) o True/False Questions o

  Short Answer Questions

- Improves self-learning through practice.

3. User Dashboard (Future Scope)

- Could track user queries and quizzes.
- Allows progress monitoring.

4. Admin Module (Future Scope)

- Monitor AI usage, quiz quality, and analytics.

Implementation

Technologies Used

- **Frontend**: Gradio (Python-based UI)
- **Backend**: Python, Hugging Face Transformers
- **AI Models**: IBM Granite (via Hugging Face)
- **Deployment**: Google Colab, GitHub

Sample Code (Concept Explanation & Quiz Generation) import

```
gradio as gr


def explain(concept):
    return f"AI-generated explanation for: {concept}"


def generate_quiz(topic):
    return f"AI-generated quiz for topic: {topic}\n1) MCQ\n2) True/False\n3) Short Answer"


with gr.Blocks() as demo:
    gr.Markdown("# EduTutor AI - Personalized Learning")


    with gr.Tab("Concept Explanation"):
        concept = gr.Textbox(label="Enter Concept")
explanation = gr.Textbox(label="AI Explanation")
concept.submit(explain, concept, explanation)

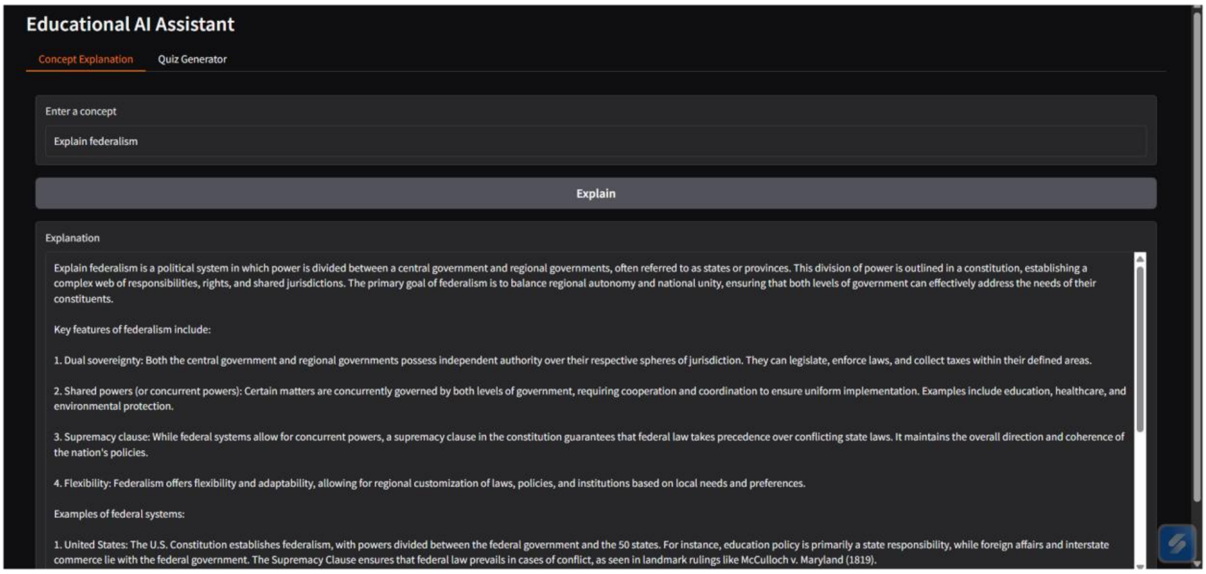

    with gr.Tab("Quiz Generator"):
```

```
    topic = gr.Textbox(label="Enter Topic")
quiz = gr.Textbox(label="AI Quiz")
topic.submit(generate_quiz, topic, quiz)


demo.launch()
```

Screenshots:

Here are some of the screenshots of the application



Explain federalism

```
Explain federalism is a political system in which power is divided between a central government and regional governments, often referred to as states or provinces. This division of power is outlined in a constitution, establishing a complex web of responsibilities, rights, and shared jurisdictions. The primary goal of federalism is to balance regional autonomy and national unity, ensuring that both levels of government can effectively address the needs of their constituents.

Key features of federalism include:

1. Dual sovereignty: Both the central government and regional governments possess independent authority over their respective spheres of jurisdiction. They can legislate, enforce laws, and collect taxes within their defined areas.

2. Shared powers (or concurrent powers): Certain matters are concurrently governed by both levels of government, requiring cooperation and coordination to ensure uniform implementation. Examples include education, healthcare, and environmental protection.

3. Supremacy clause: While federal systems allow for concurrent powers, a supremacy clause in the constitution guarantees that federal law takes precedence over conflicting state laws. It maintains the overall direction and coherence of the nation's policies.

4. Flexibility: Federalism offers flexibility and adaptability, allowing for regional customization of laws, policies, and institutions based on local needs and preferences.

Examples of federal systems:

1. United States: The U.S. Constitution establishes federalism, with powers divided between the federal government and the 50 states. For instance, education policy is primarily a state responsibility, while foreign affairs and interstate commerce lie with the federal government. The Supremacy Clause ensures that federal law prevails in cases of conflict, as seen in landmark rulings like McCulloch v. Maryland (1819).
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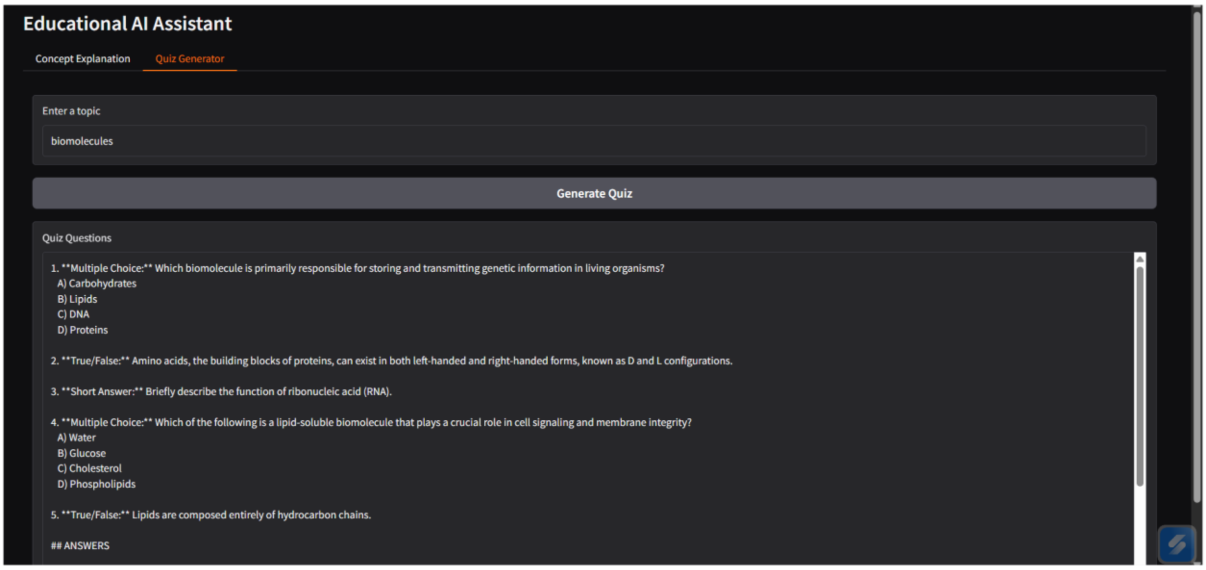


biomolecules

```
1. **Multiple Choice:** Which biomolecule is primarily responsible for storing and transmitting genetic information in living organisms?
  A) Carbohydrates
  B) Lipids
  C) DNA
  D) Proteins

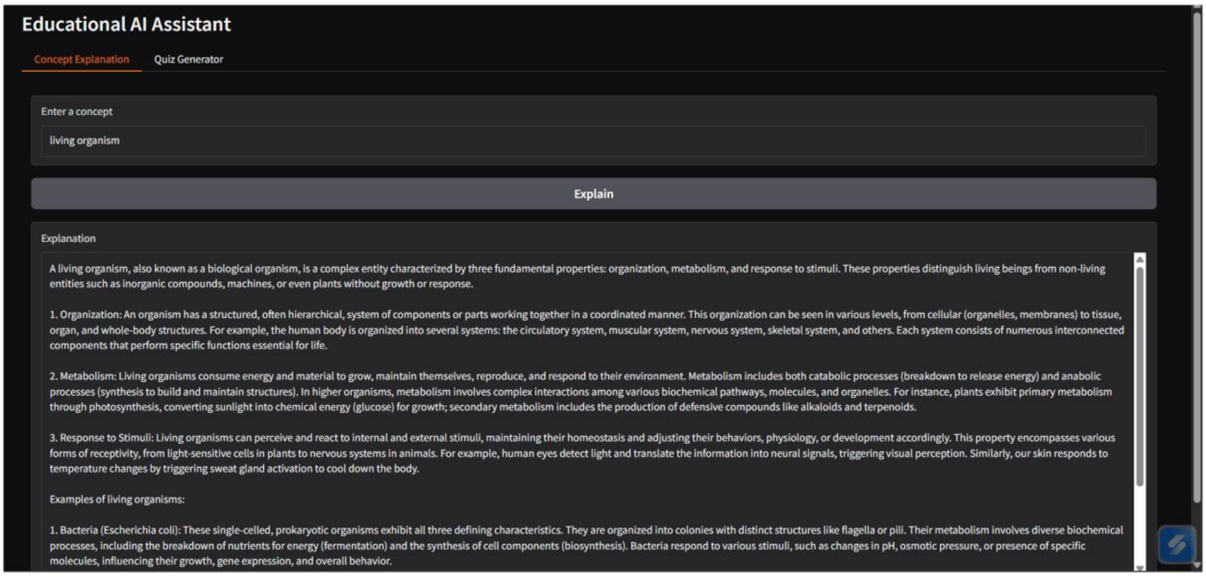
2. **True/False:** Amino acids, the building blocks of proteins, can exist in both left-handed and right-handed forms, known as D and L configurations.

3. **Short Answer:** Briefly describe the function of ribonucleic acid (RNA).

4. **Multiple Choice:** Which of the following is a lipid-soluble biomolecule that plays a crucial role in cell signaling and membrane integrity?
  A) Water
  B) Glucose
  C) Cholesterol
  D) Phospholipids

5. **True/False:** Lipids are composed entirely of hydrocarbon chains.

## ANSWERS
```



Enter a concept: living organism

Explanation

A living organism, also known as a biological organism, is a complex entity characterized by three fundamental properties: organization, metabolism, and response to stimuli. These properties distinguish living beings from non-living entities such as inorganic compounds, machines, or even plants without growth or response.

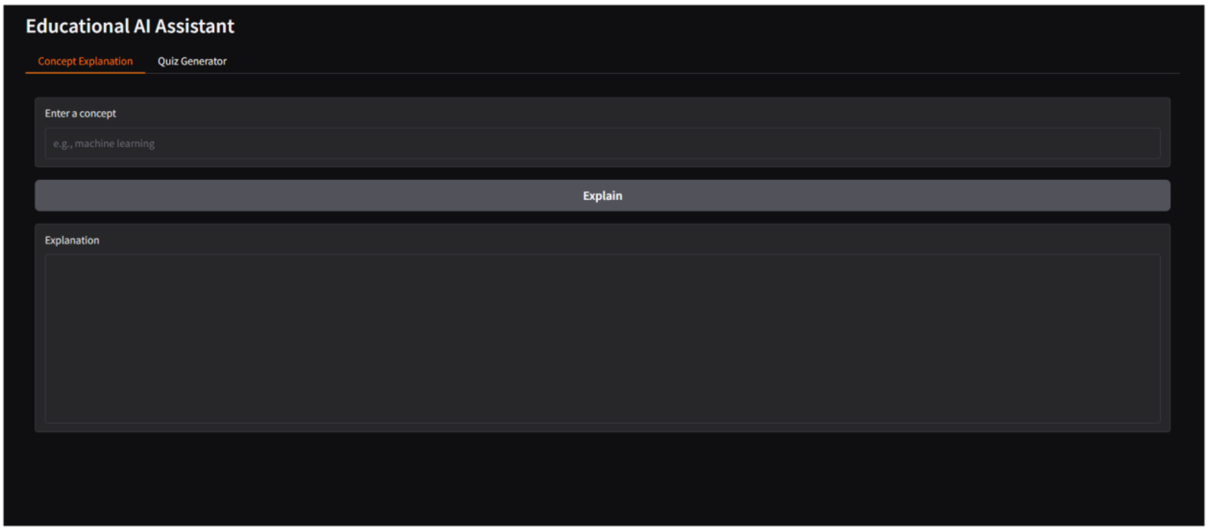
1. Organization: An organism has a structured, often hierarchical, system of components or parts working together in a coordinated manner. This organization can be seen in various levels, from cellular (organelles, membranes) to tissue, organ, and whole-body structures. For example, the human body is organized into several systems: the circulatory system, muscular system, nervous system, skeletal system, and others. Each system consists of numerous interconnected components that perform specific functions essential for life.

2. Metabolism: Living organisms consume energy and material to grow, maintain themselves, reproduce, and respond to their environment. Metabolism includes both catabolic processes (breakdown to release energy) and anabolic processes (synthesis to build and maintain structures). In higher organisms, metabolism involves complex interactions among various biochemical pathways, molecules, and organelles. For instance, plants exhibit primary metabolism through photosynthesis, converting sunlight into chemical energy (glucose) for growth; secondary metabolism includes the production of defensive compounds like alkaloids and terpenoids.

3. Response to Stimuli: Living organisms can perceive and react to internal and external stimuli, maintaining their homeostasis and adjusting their behaviors, physiology, or development accordingly. This property encompasses various forms of receptivity, from light-sensitive cells in plants to nervous systems in animals. For example, human eyes detect light and translate the information into neural signals, triggering visual perception. Similarly, our skin responds to temperature changes by triggering sweat gland activation to cool down the body.

Examples of living organisms:

1. Bacteria (Escherichia coli): These single-celled, prokaryotic organisms exhibit all three defining characteristics. They are organized into colonies with distinct structures like flagella or pili. Their metabolism involves diverse biochemical processes, including the breakdown of nutrients for energy (fermentation) and the synthesis of cell components (biosynthesis). Bacteria respond to various stimuli, such as changes in pH, osmotic pressure, or presence of specific molecules, influencing their growth, gene expression, and overall behavior.



Project Execution

1. Open **Google Colab / VS Code**.
2. Install dependencies:
3. pip install transformers torch gradio
4. Run the application:
5. python app.py
6. Click on the **Gradio link** → Start using the tutor (Concept Explanation + Quiz Generator).

Project Demo

- **Demo Video Link**: https://drive.google.com/file/d/19qseOVnY9RwXZprhQmOvIAsfY2XSjCe/view?usp=drivesdk
- **Project Source Code**:

  https://github.com/gayathriselvagurunathan/IBM-Project.git