

Project Title: Personalized Learning with Generative AI and LMS Integration.

1.Introduction :

Team ID : NM2025TMID06844

Team Size : 4

Team Leader : JAYABALAN G

Team member : DINESHKUMAR E

Team member : KISHOREKUMAR K

Team member : LINGESHWARAN C

Project Summary:

EduTutor AI is an intelligent, adaptive learning platform that leverages generative AI to deliver personalized educational experiences for students. The platform integrates seamlessly with existing Learning Management Systems (LMS) to enhance curriculum delivery, automate tutoring, and provide real-time feedback. By combining AI-driven content generation, student analytics, and dynamic learning pathways, EduTutor AI aims to revolutionize digital education and close learning gaps through tailored instruction.

Milestone 1: Requirements Specification

- **fastapi**
- **uvicorn**
- **langchain_ibm**
- **pinecone**
- **streamlit**
- **google-auth-oauthlib**
- **google-api-python-client**
- **python-dotenv**

Installation:

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

Requirements

- **fastapi**

- **uvicorn**
- **langchain_ibm**
- **pinecone**
- **streamlit**
- **google-auth-oauthlib**
- **google-api-python-client**
- **python-dotenv**

Installation:

pip install -r requirements.txt

Milestone 2: Initialization of Environment

Variables

Create a .env file with:

env

WATSONX_MODEL_ID=granite-13b-instruct-v2

WATSONX_API_KEY=your_ibm_watsonx_api_key

WATSONX_ENDPOINT=https://us-south.ml.cloud.ibm.com

WATSONX_PROJECT_ID=your_project_id

PINECONE_API_KEY=your_pinecone_api_key

PINECONE_INDEX_NAME=edututor

Initialization of Environment Variables

Create a `.env` file with:

`env`

WATSONX_MODEL_ID=granite-13b-instruct-v2

WATSONX_API_KEY=your_ibm_watsonx_api_key

WATSONX_ENDPOINT=https://us-south.ml.cloud.ibm.com

WATSONX_PROJECT_ID=your_project_id

PINECONE_API_KEY=your_pinecone_api_key

PINECONE_INDEX_NAME=edututor

Milestone 3: AI Integration with IBM Watsonx

- **Model Setup:** Granite model is loaded via `langchain_ibm.WatsonxLLM`.
- **Prompt Template:** Dynamically generates quiz questions using LangChain's `PromptTemplate`.
- **Quiz Parsing:** Watsonx output is parsed into structured JSON for display and evaluation.

AI Integration with IBM Watsonx

- **Model Setup:** Granite model is loaded via `langchain_ibm.WatsonxLLM`.
- **Prompt Template:** Dynamically generates quiz questions using LangChain's `PromptTemplate`.
- **Quiz Parsing:** Watsonx output is parsed into structured JSON for display and evaluation.

Milestone 4: Google Classroom Sync

- Uses `google-auth-oauthlib` and `google-api-python-client`.

User logs in via Google.

Google Classroom Sync

- Uses `google-auth-oauthlib` and `google-api-python-client`.
- User logs in via Google.

Milestone 5: Pinecone Vector DB Integration

- Stores each user's profile with embeddings.
- Quiz metadata (score, topic, date) is updated after submission.
- Allows educators to fetch student data and analyze progress.

Pinecone Vector DB Integration

- Stores each user's profile with embeddings.
- Quiz metadata (score, topic, date) is updated after submission.
- Allows educators to fetch student data and analyze progress.

Milestone 6: Streamlit Frontend UI

- **Student Panel:**
 - Login (Manual or Google)
 - Dashboard
 - Take Quiz
 - Quiz History

- **Educator Panel:**
 - **Dashboard (all student analytics)**

Project Goals:

1. **Personalized Learning:** Deliver customized learning experiences based on each student's performance, learning style, and pace.
2. **Generative AI Tutoring:** Use AI to generate explanations, quizzes, flashcards, and interactive content on demand.
3. **LMS Integration:** Ensure compatibility with major LMS platforms (e.g., Moodle, Canvas, Blackboard, Google Classroom).
4. **Real-Time Feedback & Assessment:** Provide immediate feedback to learners and actionable insights to educators.
5. **Scalability & Accessibility:** Make personalized education accessible to diverse student populations at scale.

Key Features:

- **AI-Powered Virtual Tutor:** Conversational agent that explains concepts, answers questions, and adapts responses based on student comprehension.
- **Content Generation Engine:** Automatically generates supplementary materials including quizzes, summaries, and interactive simulations.
- **Progress Tracking Dashboard:** Visual dashboards for students and teachers to monitor performance and engagement.
- **Smart Remediation:** Identifies learning gaps and automatically recommends targeted resources.
- **LMS Plug-In Modules:** Drop-in compatibility with popular LMS platforms using APIs or LTI (Learning Tools Interoperability) standards.

Target Users:

- K-12 Students
- Higher Education Students
- Educators and Instructional Designers
- Schools, Universities, and Online Learning Platforms

Technology Stack:

- **Frontend:** React.js / Vue.js (for interactive UI)

- **Backend:** Node.js / Python (API services)
- **AI/ML:** OpenAI GPT-4 (for generative responses), custom models for analytics
- **Database:** PostgreSQL / MongoDB
- **LMS Integration:** LTI 1.3, SCORM, REST APIs
- **Cloud Infrastructure:** AWS / Azure / Google Cloud

Expected Outcomes:

- Increased student engagement and academic performance.
- Reduced teacher workload through automation of routine tasks.
- Enhanced accessibility of personalized learning resources.
- Scalable AI tutoring across multiple subjects and grade levels.

Success Metrics:

- Student improvement rates (e.g., test scores, comprehension benchmarks)
- User adoption rates across LMS platforms
- Reduction in time educators spend on grading/content prep
- Engagement metrics (daily active users, session duration, etc.)

Project Timeline (High-Level):

Phase	Duration	Key Milestones
-------	----------	----------------

Discovery & Planning	1 month	Requirement gathering, tech stack finalization
MVP Development	3 months	Core AI tutor, LMS integration, basic analytics
Beta Testing	2 months	Pilot with partner institutions
Full Launch	1 month	Public release, marketing rollout
Iteration & Expansion	Ongoing	Feedback loops, new features, scalability

Milestone 7 : functional verification

Modular AI-Powered Architecture

- **FastAPI Backend**
Handles student/educator login, quiz generation, answer evaluation, classroom sync, and metadata updates.

User

POST /user/register Register User

Quiz

POST /quiz/generate Generate Quiz Endpoint

Google Auth

GET /auth/login Google Login

GET /auth/callback Google Auth Callback

Quiz Submission

POST /quiz/submit Submit Quiz

Educator

GET /educator/student/{user_id}/quiz-history Get Student Quiz History

- **Watsonx + Granite Models**

Generates MCQs dynamically from topic input. Provides instruction-tuned inference via LangChain Watsonx integration.

Upgrade
?
🔔
Rohan Patil's Account
Frankfurt

Train, deploy, validate, and govern AI models responsibly.

Customize my journey

[...]
Chat and build prompts with foundation models

Start chatting...

Open Prompt Lab

Build an AI agent to automate tasks
with Agent Lab

Tune a foundation model with labeled data
with Tuning Studio

Discover

Collapse Discover section

Developer access

Project or space

Project ID

EduTutor

fc5db437-02d8-4bfd-adc8-f16c2fc1393e

watsonx.ai URL

https://eu-de.ml.cloud.ibm.com

Used to call watsonx.ai APIs such as LLM inferencing, embedding, training, and chatting.

Create API key

Manage IBM Cloud API keys

Developer hub

New watsonx Developer Hub to start coding fast.

Make your first API request to inference a foundation model in watsonx.ai. Find the right foundation models and code libraries for your AI applications.

- Pinecone Vector DB**

stores user profile embeddings, quiz history metadata, and similarity search for adaptive learning.

Indexes

Create index

Search indexes

Sort by last viewed

Filter by

Showing 1 index

edututor

...

Connect

Host: https://edututor-0cpwldt.svc.aped-4627-b74a.pinecone.io

Cloud: AWS • Region: us-east-1 • Type: Dense • Capacity mode: Serverless • Dimension: 2048 • Model: llama-text-embed-v2

[BROWSER](#) [METRICS](#) [NAMESPACES \(1\)](#) [CONFIGURATION](#)

Records

SearchList/FetchAdd a record

Namespace

(Default)

Search by

Text

Text

Example text

Top K

10

Search

+ Filter

+ Rerank

Showing 1 hit

1

ID: user123

last_quiz_id: "602af2fb-582e-450c-95b4-289dc0c7230c"

last_score: 2

last_topic: "Photosynthesis"

last_total: 19

last_updated: "2025-04-12T11:36:46.987775"

SCORE


0.0087

...

- **Streamlit Frontend**

provides dashboards for both students and educators with role-based UI, quiz submission forms, and OAuth-based login.

Deploy

 **EduTutor AI Login**

Select Role

student

Enter User ID

Login

Or

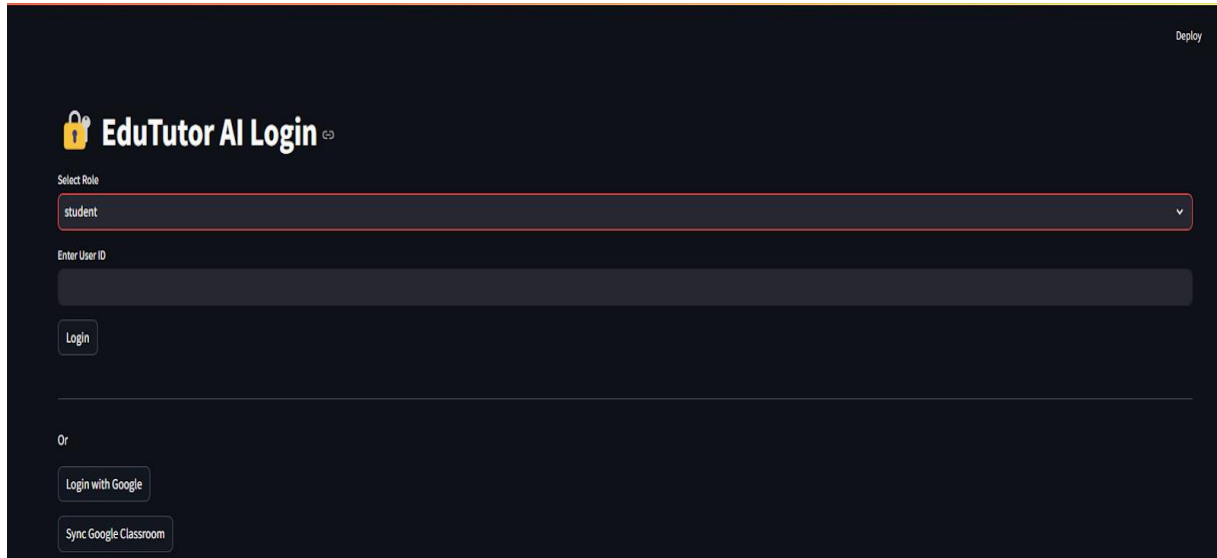
Login with Google

Sync Google Classroom

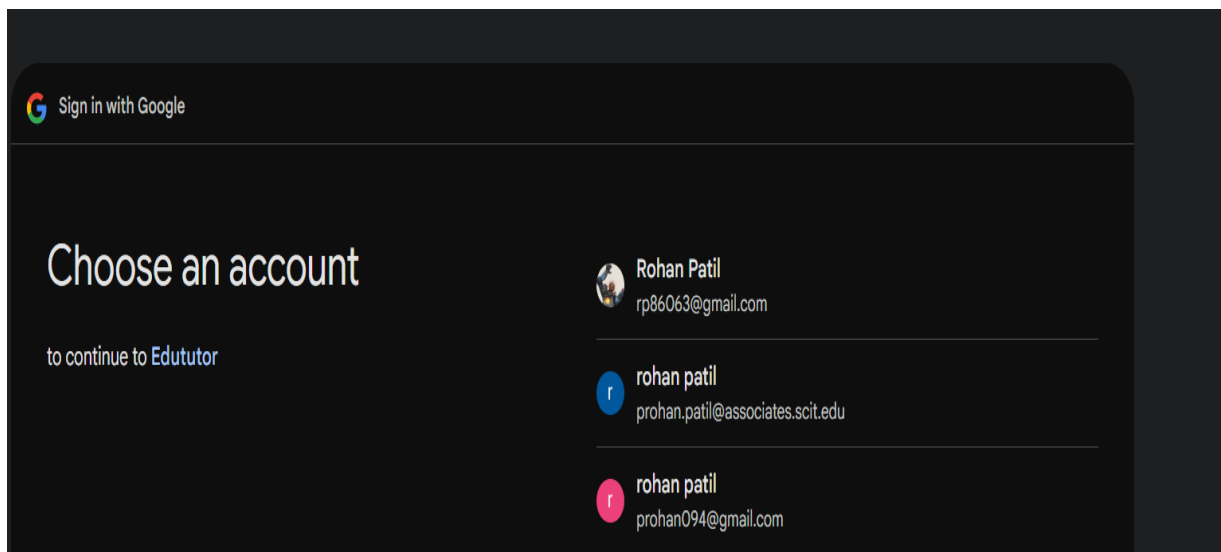
Project Flow:

1. User Input:

Students log in using credentials or Google Classroom and request a quiz by selecting topic and difficulty.



The image shows the 'EduTutor AI Login' interface. It features a dark blue background with a yellow padlock icon and the text 'EduTutor AI Login' at the top. Below this, there is a 'Select Role' dropdown menu with 'student' selected. Underneath is an 'Enter User ID' text input field. A 'Login' button is positioned below the input field. Further down, there is an 'Or' separator, followed by 'Login with Google' and 'Sync Google Classroom' buttons. A 'Deploy' button is visible in the top right corner.



The image shows a Google account selection screen. At the top, it says 'Sign in with Google'. Below this, the text 'Choose an account' is displayed. Underneath, it says 'to continue to Edututor'. On the right side, there are three account options, each with a profile picture, a name, and an email address:

- Rohan Patil
rp86063@gmail.com
- rohan patil
prohan.patil@associates.scit.edu
- rohan patil
prohan094@gmail.com

2. AI Quiz Generation:

Watsonx+Granite models generate MCQs, stored temporarily without answers in the frontend and with answers in the backend.

localhost:8501

EduTutor Navigation

Select a page

- Dashboard
- Take Quiz
- Quiz History

Take a Quiz

Enter Topic
PhotoSynthesis

Difficulty
easy

Number of Questions
1 5 10

Generate Quiz

Quiz generated. Answer the questions below!

Q2. The primary pigment involved in photosynthesis is...

- Chlorophyll a
- Chlorophyll b
- Carotene
- Xanthophyll

Q3. What is the main function of the stroma in plant cells during photosynthesis?

- It is the site of light-dependent reactions.
- It is the site of light-independent reactions (Calvin cycle).
- It stores excess glucose produced during photosynthesis.
- It is the site of cell division.

Q4. During photosynthesis, which gas is released as a byproduct?

- Oxygen
- Carbon dioxide
- Nitrogen
- Hydrogen

Q5. What is the role of water during the light-dependent reactions of photosynthesis?

- It provides electrons for the electron transport chain.
- It splits into hydrogen and oxygen, releasing oxygen as a byproduct.
- It is used to produce glucose through the Calvin cycle.

3. User Quiz Submission:

Students submit answers via UI. The backend evaluates the answers, scores the quiz, and stores it in Pinecone DB. But some errors couldn't build the frontend part of it

Showing 1 hit

1	ID: user123
	last_quiz_id: "602af2fb-582e-450c-95b4-289dc0c7230c"
	last_topic: "Photosynthesis"
	last_score: 2
SCORE	last_topic: "Photosynthesis"
0.0087	last_total: 19
	last_updated: "2025-04-12T11:36:46.987775"

- 4. Feedback Loop:**
Educators access this data in the dashboard.