Project Report

EduTutor AI: Personalized Learning with Generative AI and LMS Integration

1. INTRODUCTION

1.1 Project Overview

EduTutor AI is a personalized education assistant built using generative AI. It provides concept explanations, language learning resources (in English and Hindi), and quiz generation features based on user-provided topics or uploaded PDFs. The system is developed using Python, integrated with the IBM Granite 3.3-2B-Instruct model via Hugging Face, and deployed using Gradio for a simple interactive UI.

1.2 Purpose

The purpose of EduTutor AI is to bridge the gap in personalized learning by delivering instant AI-powered educational support to learners. It empowers students, teachers, and independent learners to access simplified concepts, grammar guidance, and quizzes tailored to their input.

2. IDEATION PHASE

2.1 Problem Statement

Students often lack access to immediate, tailored explanations of academic concepts. Teachers spend significant time preparing tests and assessments. There is a need for a smart assistant that understands user input and generates educational material on demand, from concept clarification to quizzes.

I am	I'm trying to	But	Because	Which makes me feel
a student preparing for exams and trying to learn complex topics independently	understand subjects like Generative AI, grammar, or math on my own, and generate practice quizzes	I struggle to get personalized explanations or useful feedback	most online tools are generic, not tailored to my learning needs, and educators don't have time to provide one-on-one guidance	confused, stressed, and uncertain about my preparation

2.2 Empathy Map Canvas

Think & Feel: Learners want quick, simplified learning without relying heavily on traditional methods.
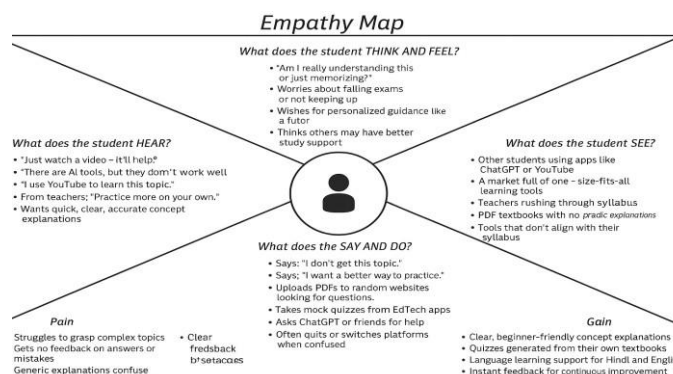
See: Overwhelming resources, confusing textbooks, too many tools.

Say & Do: Ask for help, search online, prefer interactive formats.

Hear: "This topic is hard", "Try YouTube or ChatGPT".

**Pain**: Time-consuming search, inconsistent content, lack of quizzes.

Gain: Single tool offering explanations, language learning, and MCQs.

2.3 Brainstorming

Key ideas:

- Provide AI-based explanations in simple language

- Support multiple languages

- Accept books/PDFs to generate questions

- Provide login and user session management

- Avoid need for deep tech knowledge to use the app
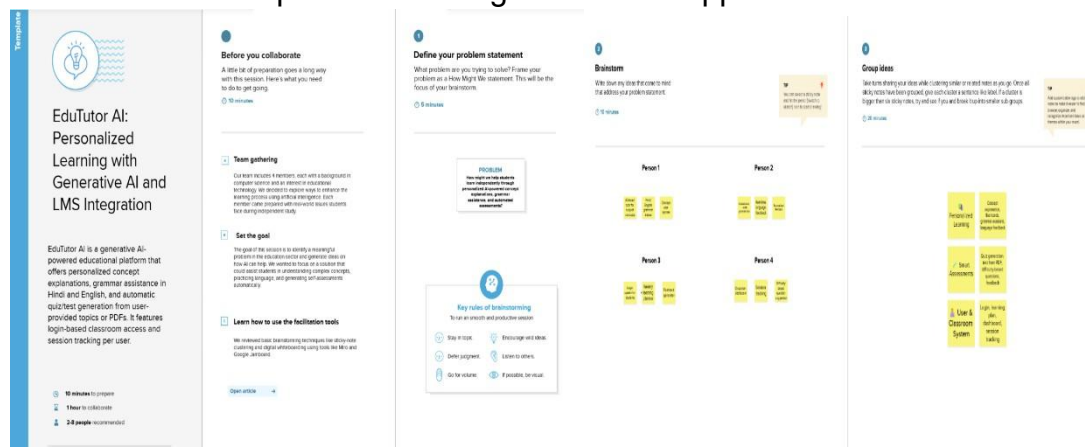
3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map Stages:

- Awareness → Sees AI tool on search/social

- Consideration → Tests concept and PDF quiz feature

- Onboarding → Registers and inputs concepts

- Engagement → Uses regularly for various subjects

- Retention → Returns often for practice

- Referral → Recommends to peers after useful experience

3.2 Solution Requirement The

system must support:

- Concept input and prompt processing

- Language selection (English/Hindi)

- PDF reading and question generation

- Topic-based quiz generation

- Session tracking

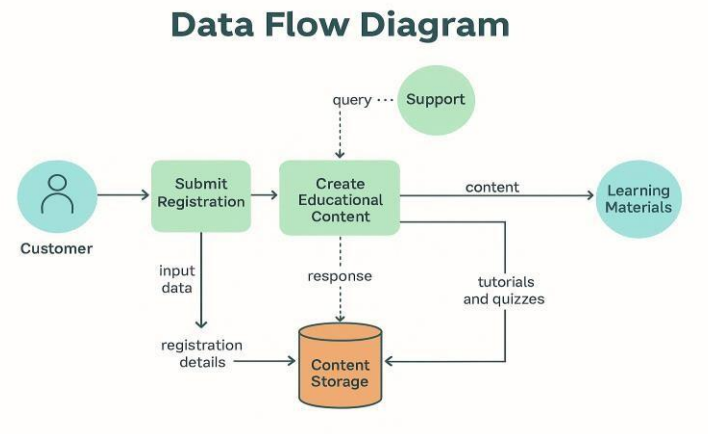- Basic login and registration

3.3 Data Flow Diagram

User → Gradio UI → Backend processing
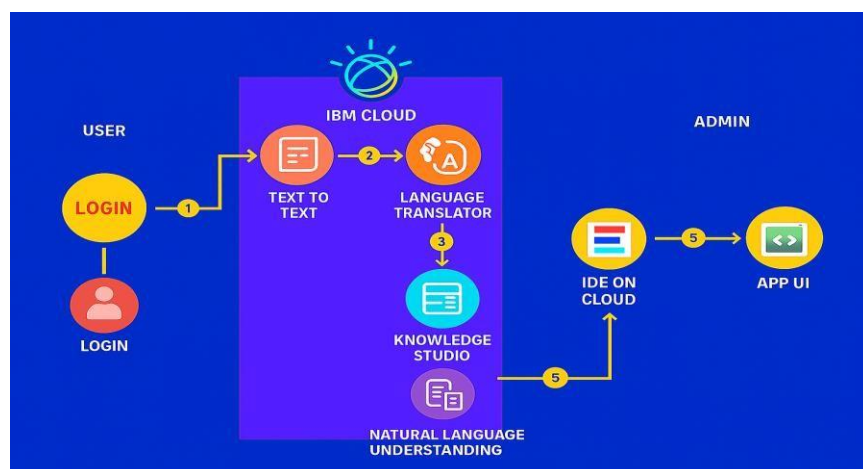→ Prompt sent to Hugging Face model

→ Response displayed back to user
→ Sessions tracked in Python dictionary

3.4 Technology Stack

- Python

- Gradio (UI)

- Hugging Face Transformers (API)

- PyPDF2 (PDF parsing)

- IBM Granite 3.3-2B-Instruct (LLM)

- Google Colab / Jupyter (execution environment)

4. PROJECT DESIGN

4.1 Problem Solution Fit

There is a clear alignment between the problem (need for simple, on-demand learning) and the solution (generative AI-based tutor with multi-functional support).

1. CUSTOMER SEGMENT(S) **CS** High school & college students, self-learners, teachers	6. CUSTORER CONSTRAINTS **CC** Limited time, no access to tutors, po feedback, poor app quality	5. AVAILABLE SOLUTIONS YouTube videos, ChatGPT textbook quizzes—but not personalized or syilabus spcific
2. JOBS-TO-BE-DONE / PROBLEMS **JP** Want a personalized learning tool to understand topics and get assessed easily	9. PROBLEM ROOOT CAUJSE **BE** Jump between platforms, ask friends, use ChatGPT, watch	7. BEHAVIOUR **AS** Jump between platforms, ask friends, use ChatGPT watch videos
3. TRIGGERS **TR** Struggle in test preparation lack of teacher feedback, poor resuts	4. EMOTIONS: BEFORE / AFTER Generic tools don't adapt to individual learning styles or content needs	8. CHANNELS OF BEHAVIOUR **CH** Online: Google, YouTube, EdTech forums Offline: Peer study groups, handwritten notes
4. EMOTIONS: BEFORE / AFTER **EM** Before: Confused, anxlous about exams After: Confident, motivated to learn	10. YOUR SOLUTION EduTutor AI; Personaniized AI tutor for concept explanation, grammar, and quiz generation	10. YOUR SOLUTION **SL** EduTutor AI: Personalized AI tutor for concept explanation, grammar, and quiz genotation (PDF/topic-based)

4.2 Proposed Solution

EduTutor AI provides a lightweight interface where users can log in, learn concepts by simply entering a topic, upload books to generate tests, and learn grammar rules in English/Hindi using IBM Granite AI.

4.3 Solution Architecture

- **Frontend**: Gradio Blocks UI

- **Backend**: Python processing logic

- **Model API**: Hugging Face (Granite 3.3-2B)

- **File Handler**: PyPDF2

- **Session Tracker**: Python dictionary

- **Optional**: Extendable to Firebase or LMS integration

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Sprint 1 (5 Days)

- User login system

- Concept explanation using AI

- Language selection logic
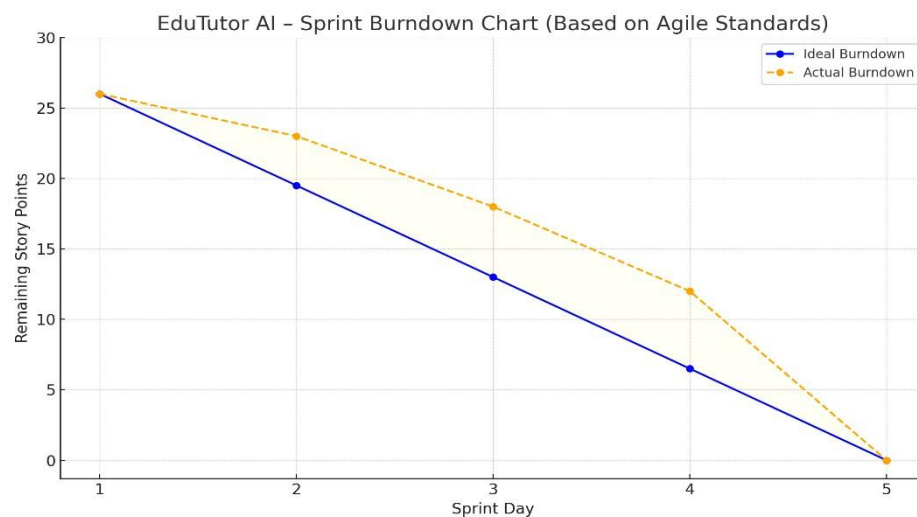
- Basic session management

Sprint 2 (5 Days)

- PDF upload & quiz generation

- Topic-based quiz creation

- Gradio UI integration

- Final testing and demo setup

Total Story Points: 26
Team Velocity: 13 points per sprint
Burndown Chart: Demonstrates consistent task completion across sprints

EduTutor AI – Sprint Burndown Chart (Based on Agile Standards)

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

- Response time for quiz generation < 4 seconds

- Multiple PDF uploads handled without crash

- Model responds within acceptable time under load

- Login and registration system behaves as expected

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7. RESULTS

7.1 Output Screenshots

- **Concept Output**: Clear explanation for entered topic

- **Language Output**: Grammar points, parts of speech

- **Quiz Output**: MCQs from both topic and PDF content

- Interface is clean, responsive, and user-friendly
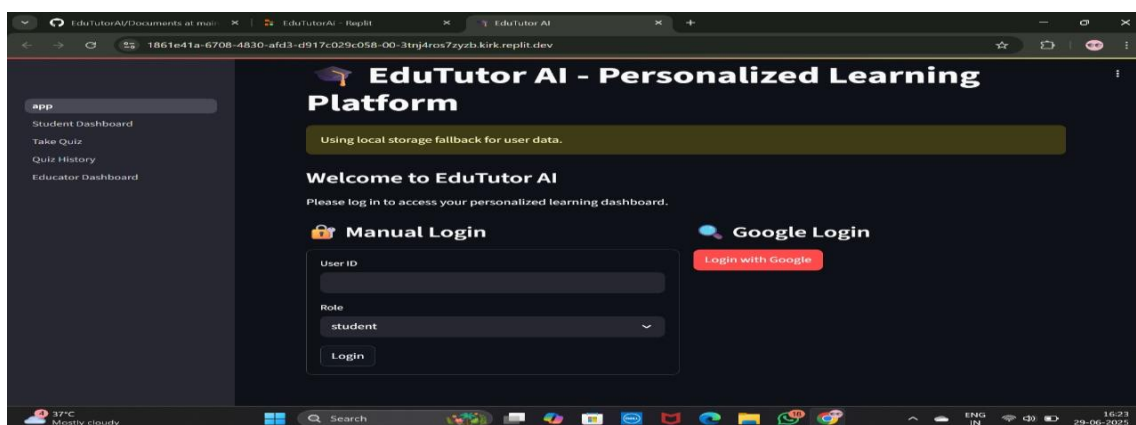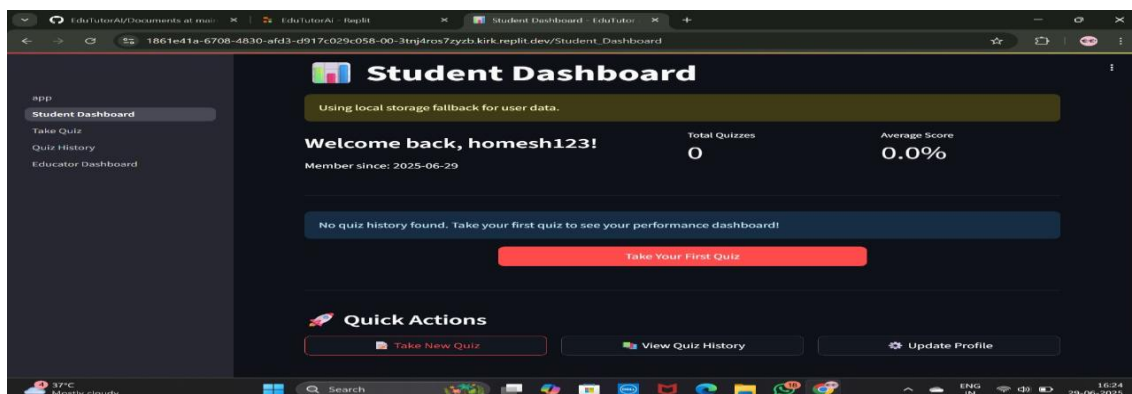
📝 **Take Quiz**

Using local storage fallback for user data.

📚 **machine learning**

Difficulty
Medium

Time Left
04:59

Question 1 of 5

Question 1

What is an important concept in machine learning?

Select your answer:
- A) Basic principle of machine learning
- B) Advanced theory in machine learning
- C) Common misconception about machine learning
- D) Unrelated concept

Next ➡️ | Progress (0/5) | **Submit Quiz**

📝 **Take Quiz**

Using local storage fallback for user data.

🎯 **Quiz Setup**

Configure your personalized quiz below:

Quiz Topic
e.g., Python Programming, Mathematics, History

Number of Questions
5
3   10

Difficulty Level
medium

Time Limit (minutes)
15

Generate Quiz

🎉 **Quiz Completed!**

Score
0/5

Percentage
0.0%

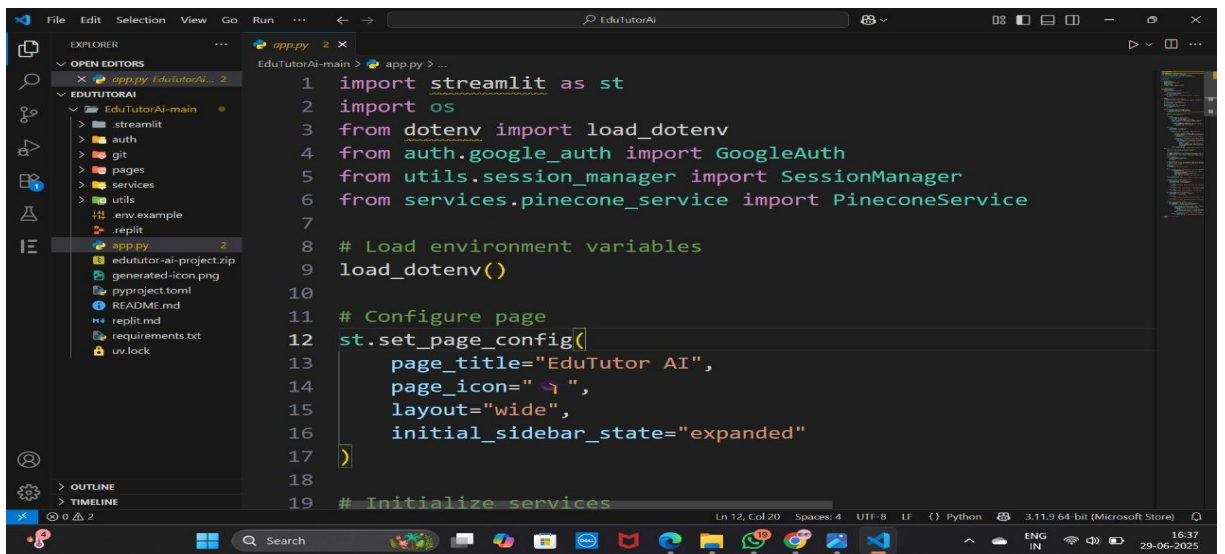Time Taken
869.2s

Grade
F

📊 **Performance Analysis**

📚 Keep studying! Consider reviewing the material and trying again.

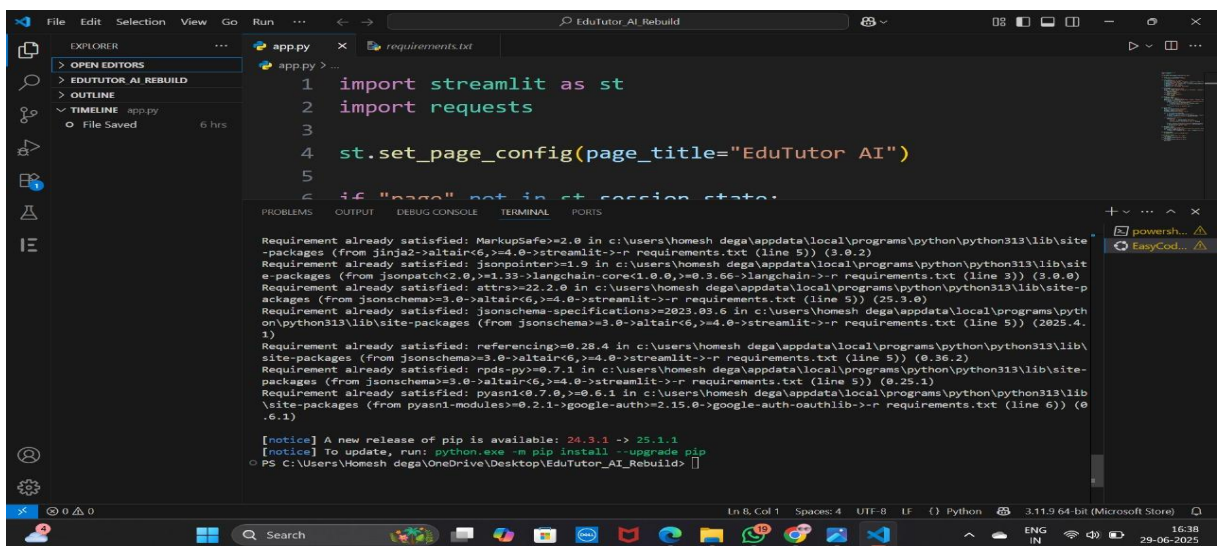**Take Another Quiz** | View Quiz History | Back to Dashboard

```python
import streamlit as st
import os
from dotenv import load_dotenv
from auth.google_auth import GoogleAuth
from utils.session_manager import import SessionManager
from services.pinecone_service import PineconeService

# Load environment variables
load_dotenv()

# Configure page
st.set_page_config(
    page_title="EduTutor AI",
    page_icon=" ",
    layout="wide",
    initial_sidebar_state="expanded"
)

# Initialize services
```



```python
import streamlit as st
import requests

st.set_page_config(page_title="EduTutor AI")

if "page" not in st.session_state:
```

Terminal output:
```
Requirement already satisfied: MarkupSafe>=2.0 in c:\users\homesh dega\appdata\local\programs\python\python313\lib\site
-packages (from jinja2->altair<6,>=4.0->streamlit->-r requirements.txt (line 5)) (3.0.2)
Requirement already satisfied: jsonpointer>=1.9 in c:\users\homesh dega\appdata\local\programs\python\python313\lib\sit
e-packages (from jsonpatch<2.0,>=1.33->langchain-core<1.0.0,>=0.3.66->langchain->-r requirements.txt (line 3)) (3.0.0)
Requirement already satisfied: attrs>=22.2.0 in c:\users\homesh dega\appdata\local\programs\python\python313\lib\site-p
ackages (from jsonschema>=3.0->altair<6,>=4.0->streamlit->-r requirements.txt (line 5)) (25.3.0)
Requirement already satisfied: jsonschema-specifications>=2023.03.6 in c:\users\homesh dega\appdata\local\programs\pyth
on\python313\lib\site-packages (from jsonschema>=3.0->altair<6,>=4.0->streamlit->-r requirements.txt (line 5)) (2025.4.
1)
Requirement already satisfied: referencing>=0.28.4 in c:\users\homesh dega\appdata\local\programs\python\python313\lib\
site-packages (from jsonschema>=3.0->altair<6,>=4.0->streamlit->-r requirements.txt (line 5)) (0.36.2)
Requirement already satisfied: rpds-py>=0.7.1 in c:\users\homesh dega\appdata\local\programs\python\python313\lib\site-
packages (from jsonschema>=3.0->altair<6,>=4.0->streamlit->-r requirements.txt (line 5)) (0.25.1)
Requirement already satisfied: pyasn1<0.7.0,>=0.6.1 in c:\users\homesh dega\appdata\local\programs\python\python313\lib
\site-packages (from pyasn1-modules>=0.2.1->google-auth>=2.15.0->google-auth-oauthlib->-r requirements.txt (line 6)) (0
.6.1)

[notice] A new release of pip is available: 24.3.1 -> 25.1.1
[notice] To update, run: python.exe -m pip install --upgrade pip
PS C:\Users\Homesh dega\OneDrive\Desktop\EduTutor_AI_Rebuild>
```
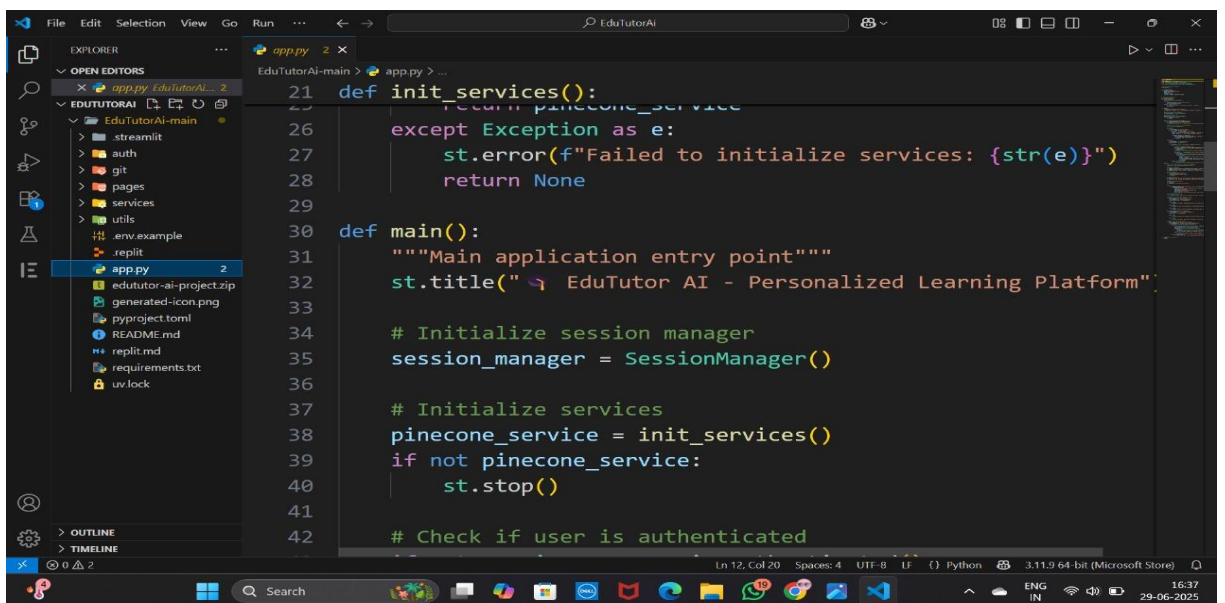


```python
def init_services():
        return pinecone_service
    except Exception as e:
        st.error(f"Failed to initialize services: {str(e)}")
        return None

def main():
    """Main application entry point"""
    st.title(" EduTutor AI - Personalized Learning Platform")

    # Initialize session manager
    session_manager = SessionManager()

    # Initialize services
    pinecone_service = init_services()
    if not pinecone_service:
        st.stop()

    # Check if user is authenticated
```

8. ADVANTAGES & DISADVANTAGES

Advantages:

- AI-generated explanations with real-time response

- Supports PDF-to-quiz transformation

- No complex UI/UX for end users

- Language selection allows multilingual learners **Disadvantages**:

- Requires internet (depends on Hugging Face API)

- No database yet for persistent session saving

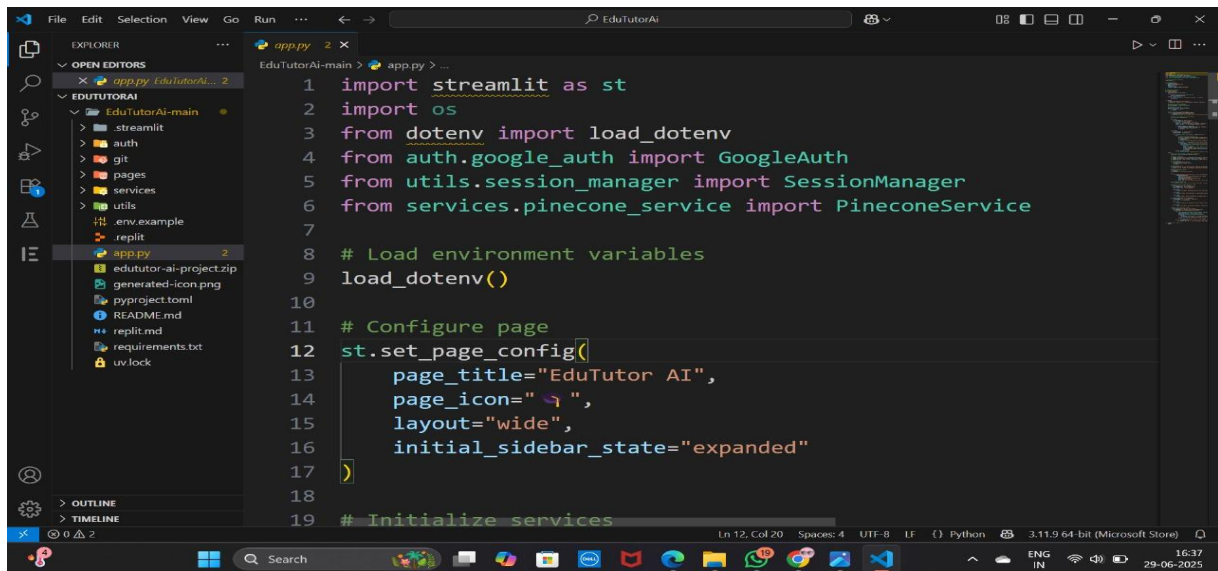- Quiz evaluation module not implemented

9. CONCLUSION

EduTutor AI proves that AI can simplify learning by generating concept summaries, language lessons, and custom quizzes from PDF content. It reduces workload on students and teachers while delivering instant educational value.
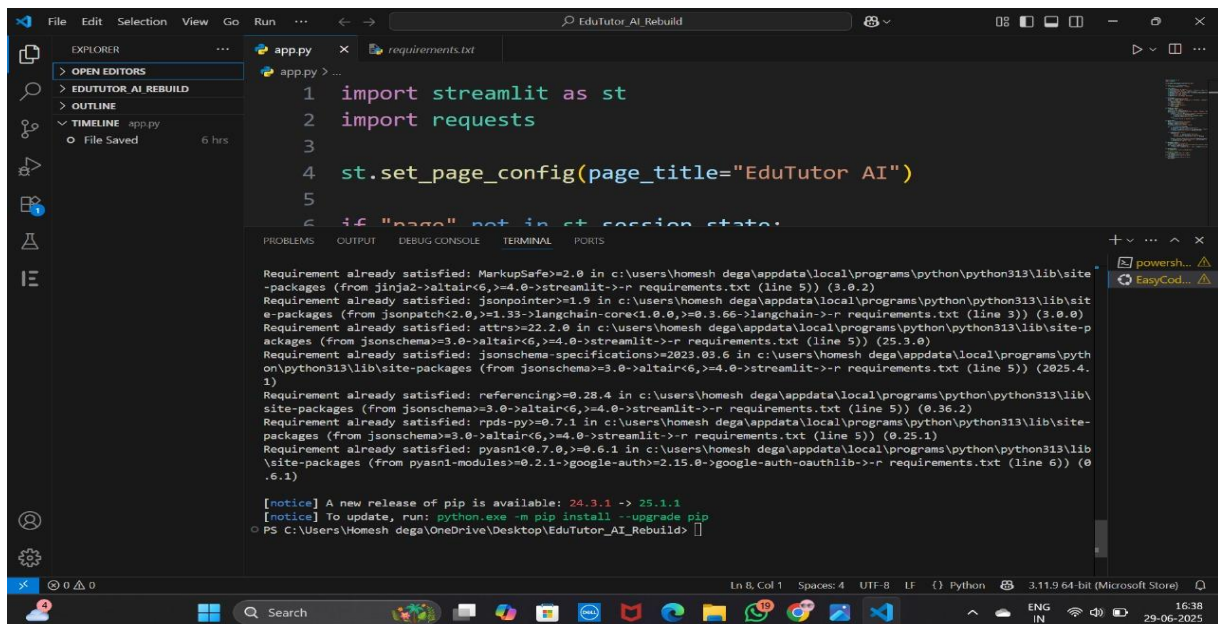
10. FUTURE SCOPE

- Connect to LMS platforms (like Moodle, Google Classroom)

- Add answer evaluation and quiz scoring

- Persist data using Firebase/PostgreSQL

- Support voice inputs using STT models

- Add analytics and progress tracking for learners

11. APPENDIX

- **Source Code**: Python script / Google Colab Notebook

Screenshot 1:

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from services.pinecone_service import PineconeService

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# Configure page
st.set_page_config(
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    layout="wide",
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# Initialize services
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Screenshot 2:

```python
import streamlit as st
import requests

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if "page" not in st.session_state:
```

Terminal output:
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[notice] To update, run: python.exe -m pip install --upgrade pip
PS C:\Users\Homesh dega\OneDrive\Desktop\EduTutor_AI_Rebuild> []
```
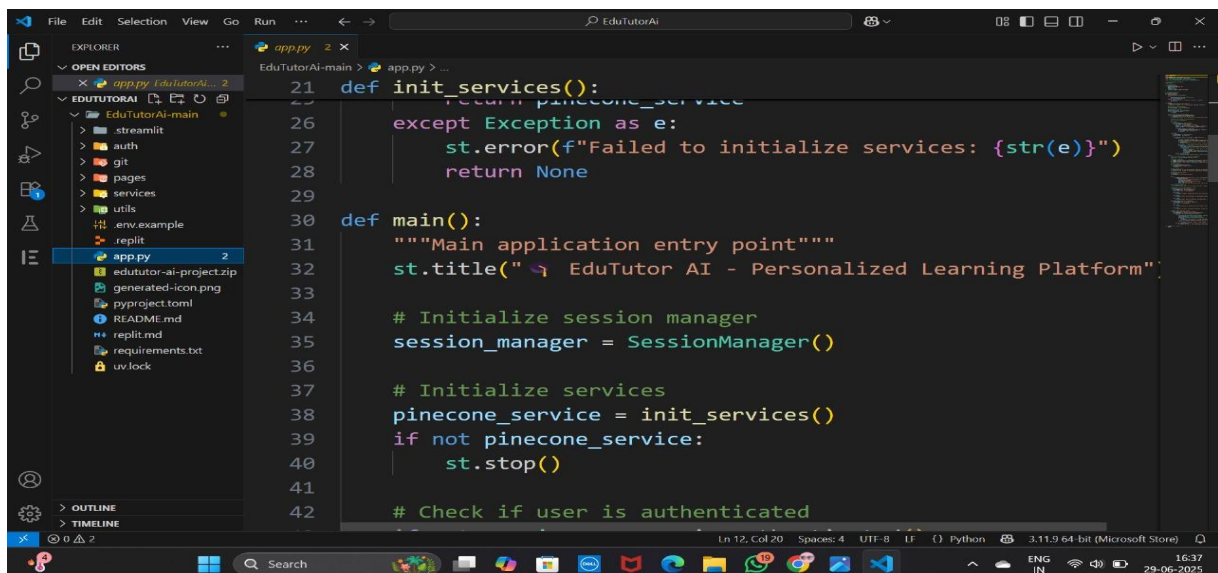
Screenshot 3:

```python
def init_services():
        return pinecone_service
    except Exception as e:
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        return None

def main():
    """Main application entry point"""
    st.title("🎓 EduTutor AI - Personalized Learning Platform")

    # Initialize session manager
    session_manager = SessionManager()

    # Initialize services
    pinecone_service = init_services()
    if not pinecone_service:
        st.stop()

    # Check if user is authenticated
```

- **Dataset Link**: Not applicable (PDFs provided by user)

- **GitHub & Project Demo Link**:

  https://github.com/homeshdega2005/EduTutorAi.git

  Demo video link:

  https://drive.google.com/file/d/1yM-XRP--orc7EiML8U9gTENLvBt5txV7/view?usp=drivesdk