

AI-Powered Personal Tutor: A Scalable, Adaptive Learning System for Enhanced Student

ABSTRACT

AI-Tutor using AI which is an Intelligent Tutoring System (ITS) providing personalized learning alternatives to improve student engagement. It captures student progress and provides immediate feedback, making improvements to instructional content to enhance learning efficiency. AI-Tutor focuses on addressing the shortcomings of the education system by making learning effective and tailored for each learner through AI-based tools.

The platform gets the whole learning process automated, dynamic multiple-choice questions, automated course, and student performance analysis. AI-Tutor classifies student based on their skill sets so that they get learning paths and recommendations personalized. An easy-to-use interface allows students to seamlessly navigate between courses, quizzes, or progress reports teachers can easily.

1. INTRODUCTION

1.1 Motivation:

Despite the rapid transformation of the education sector through digitalisation, many traditional teaching methods are not able to provide personalised and engaging learning experiences to the students. There is universal agreement that an intelligent adaptive learning system is needed. AI-Tutor aims to bridge this gap by using AI to enhance connection and learning effectiveness.

1.2 Objective:

AI-Tutor is designed to allow for a personalized learning experience where the format of learning content is customizable based on a student's learning results.

The technology is meant to:

- Use active learning techniques to increase student engagement
- Give faculty insight into how students learn
- Providing live feedback and support
- Differentiate difficulty of content in accordance with student performance

1.3 Problem Description:

Traditional educational systems often follow a standardized curriculum that ignores the individual needs of each student. Among the significant issues are:

- 1) Lack of opportunity for individualized education
- 2) Low use of resources for online learning
- 3) inability to properly track and assess student achievement

Teachers are too busy to help students one-on-one.

AI-Tutor seeks to solve these problems by implementing an AI-driven teaching system that adapts to each student's particular learning preferences.

1.4 Challenges :

Here are some challenges to get past when building an AI-based Tutors system:

- DataProcessing & Collection: Fetching better datasets for training of AI models

Rich content was annotated by curating rich content and annotating it

- Model Accuracy: Ensuring that the AI makes sensible suggestions
- Scalability: being able to expand the system to support other subjects and more user types
- Security & Privacy: Safety and security of student information and ensuring ethical usage of AI

2.LITERATURE SURVEY

New digital tools and artificial intelligence are changing how education can be delivered in different environments. Therefore, the role of online tutors, AI e-learning platforms and students' attitude towards new technologies are critical in improving learning outcomes.

(1) Wang and Qiao report on the pivotal role in enhancing online learning that online tutors must play. Their research notes that tutors are not merely deliverers of content, but rather the lynchpins of organized and intentional learning activities. They argue that with online tutors in particular, they need to design engaging tasks, moderate community forums, and offer tailored support to match learners' individual needs. The authors say given the proper tutors' support, online education can greatly enhance, especially in China's deepening.

Paper [2]- Mohammed A. M. Algerafi and co-authors explore the willingness of Chinese university students to adopt AI-based robots for the purpose of education. The study tests 14 hypotheses based on the Technology Acceptance Model 3 (TAM3), and 12 of them are supported.

The results reveal a predominantly favorable view on the use of AI in education, noting that students would like to utilize AI-based robotic tools. In fact, variables such as relevance to jobs, and robot anxiety had little impact on students' perception of usefulness and ease of use. These findings are useful for developers and educators and also for policymakers looking to maximize how well AI tools like ChatGPT are integrated into academic environments.

3. Analyzing requirements

3.1 Functional Requirements:

User Authentication: Students should be able to sign up and login.

Adaptive Learning: Predictive and analytical tools should provide study materials customized for each student based on their performance.

Assessment & Feedback: Quizzes, evaluations and feedback options.

Learning Progress Tracking: A feature that helps students to track how they are progressing with their learning.

Data Limitations: Trained with data until October 2023

3.2 Non-Functional Requirements

Scalability: The System has the scalability to allow multiple users at once.

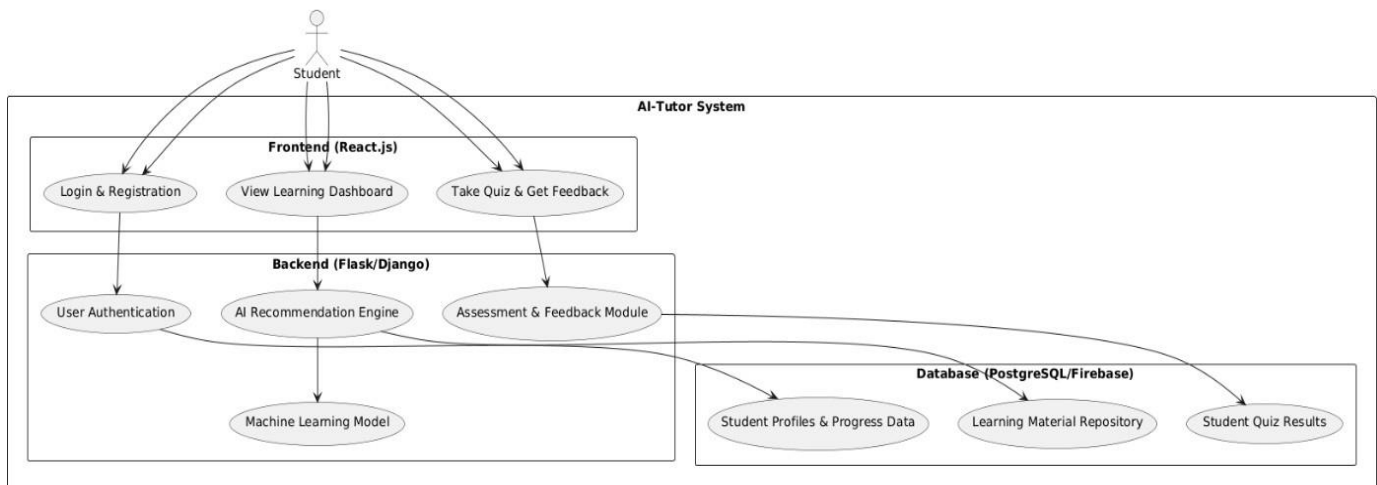
Security: All user data must be securely stored.

Ui: The UI (user interface) need to be user inviting and reachable

Performance: The system should have ability to provide real-time responses to user queries.

Availability: Must be available 24/7 with low downtime.

4. ARCHITECTURE AND DESIGN



5. IMPLEMENTATION

Project Implementation Details

AI-Powered Personal Tutor: A scalable and adaptable learning environment for better Student, is an AI-based educational platform that on-the-fly creates courses, examinations, and quizzes, that is, a personalized learning experience. Here's a summary of how it was implemented based on the files you sent.

1. Project Structure & Implementation

Our project is made up of 3 general modules:

A. User Authentication & Management

- CSV formatted data files containing entry information.
- You do this by plugging in some info (name, username, password, age, grade).
- The authentication service approves the credentials and retrieves the valid user information.
- You do this by entering some information like name, username, password, age and grade.

B. Preassessment Module

- There's a pre-test to determine the student's proficiency level (Beginner, Intermediate, Advanced).
- Courses use randomly selected MCQs and score as a way to adjust difficulty.
- Evidence of performance feedback.

C. AI-Powered Course Generation

- When you ask Gem to make a course about writing a novel, Genz course-creating AI (with Llama3:8b or Gemma 2B via Ollama as backend) generates a structured course.
- Each course is made of modules, and modules consist of submodules.
- For you, the system creates elaborate text with vivid illustrations and actionable ideas.

D. Course Content UI

- The papers are organized by users to enable them to save their progress and see the materials of the lectures throughout the duration of those lectures.
- Progress through modules represented visually (donut charts)
- Status tracking enables structured learning.

E. MCQ-Based Assessment

- The AI learning tool generates test questions from course material.
- They use a retrieval-augmented generation (RAG) method.
- It tracks user-specific questions using CSV files.
- Users get feedback and scores for iterations.

F. UI & Navigation

- Streamlit: An interactive way of learning.
- Side menu in, course selection, content consumption and quizzes.

2. File Breakdown

Here's how each file contributes to our project:

Main Application

- Main file : Here, in the project root this file will take care of all the UI components as per the user interaction.
- Course generation file: Responsible for creating a course by using AI models to generate the appropriate learning paths.
- Course content generation file :Generate content for the course module.

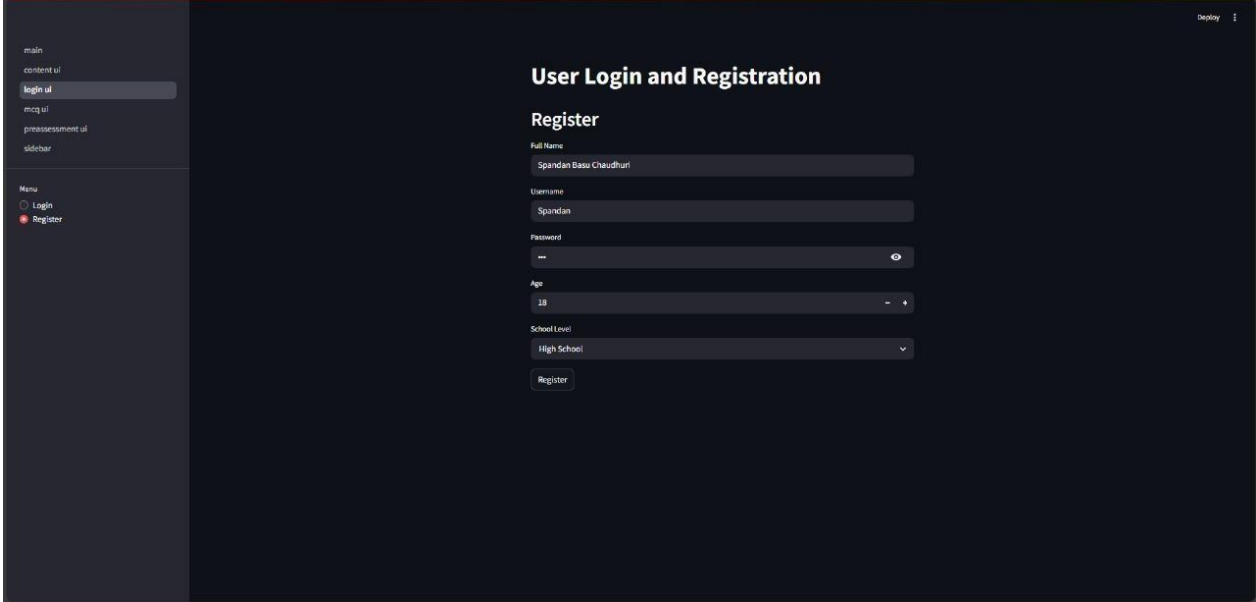
MCQ Generation & Evaluation

- Mcq gen file – Uses the Gemma 2B model (under Ollama) to create multiple-choice questions based on the course material.

User Interface & Data Storage

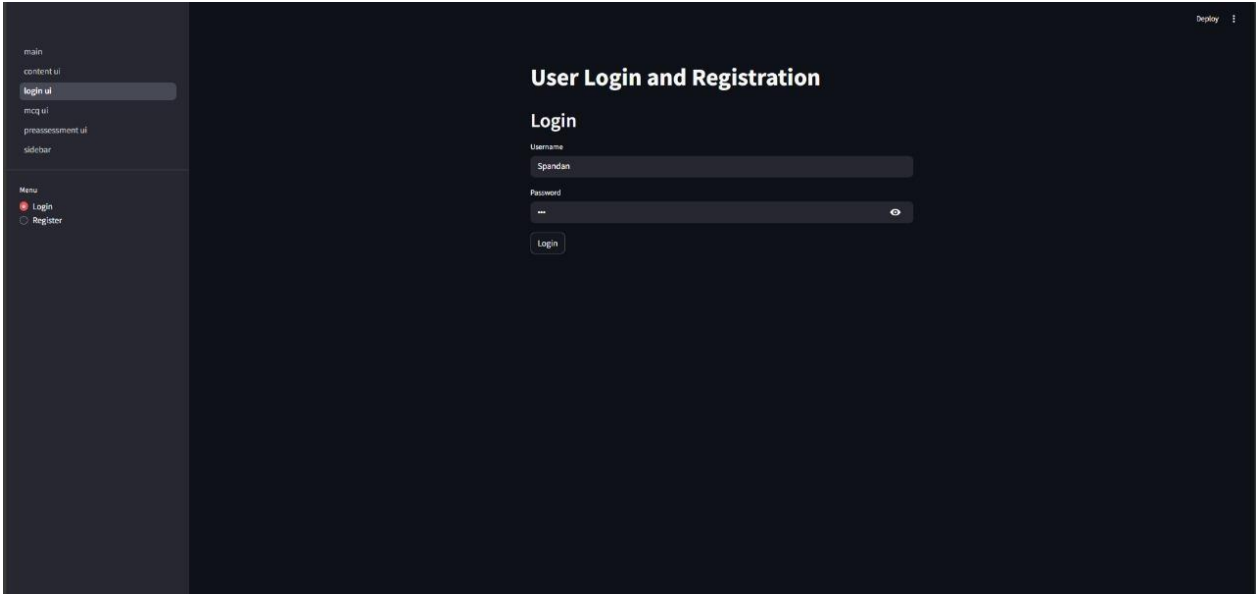
- Authentication and user profiles are managed through CSV files.
- Personalized learning: The system tracks user progress and performs quizzes to create personalized learning.

6. EXPERIMENT RESULTS



The screenshot displays a web application interface with a dark theme. On the left, there is a sidebar menu with the following items: 'main', 'content ui', 'login ui' (highlighted), 'mcq ui', 'preassessment ui', and 'sidebar'. Below the menu is a 'Menu' section with radio buttons for 'Login' and 'Register' (selected). The main content area is titled 'User Login and Registration' and features a 'Register' form. The form includes input fields for 'Full Name' (containing 'Spandan Basu Choudhuri'), 'Username' (containing 'Spandan'), 'Password' (with a toggle icon), 'Age' (a numeric input field with '18'), and 'School Level' (a dropdown menu showing 'High School'). A 'Register' button is located at the bottom of the form. In the top right corner, there is a 'Deploy' button.

Fig 1: Registration page



The screenshot displays the same web application interface as Figure 1, but with the 'Login' form active. The sidebar menu remains the same, with 'login ui' highlighted. In the 'Menu' section, the 'Login' radio button is now selected. The main content area is titled 'User Login and Registration' and features a 'Login' form. The form includes input fields for 'Username' (containing 'Spandan') and 'Password' (with a toggle icon). A 'Login' button is located at the bottom of the form. The 'Deploy' button remains in the top right corner.

Fig 2: Login Page

About Fig 1&2 –

After entering to the website user have to register their account details and then they have to login with their credentials.



Fig 3: After user login

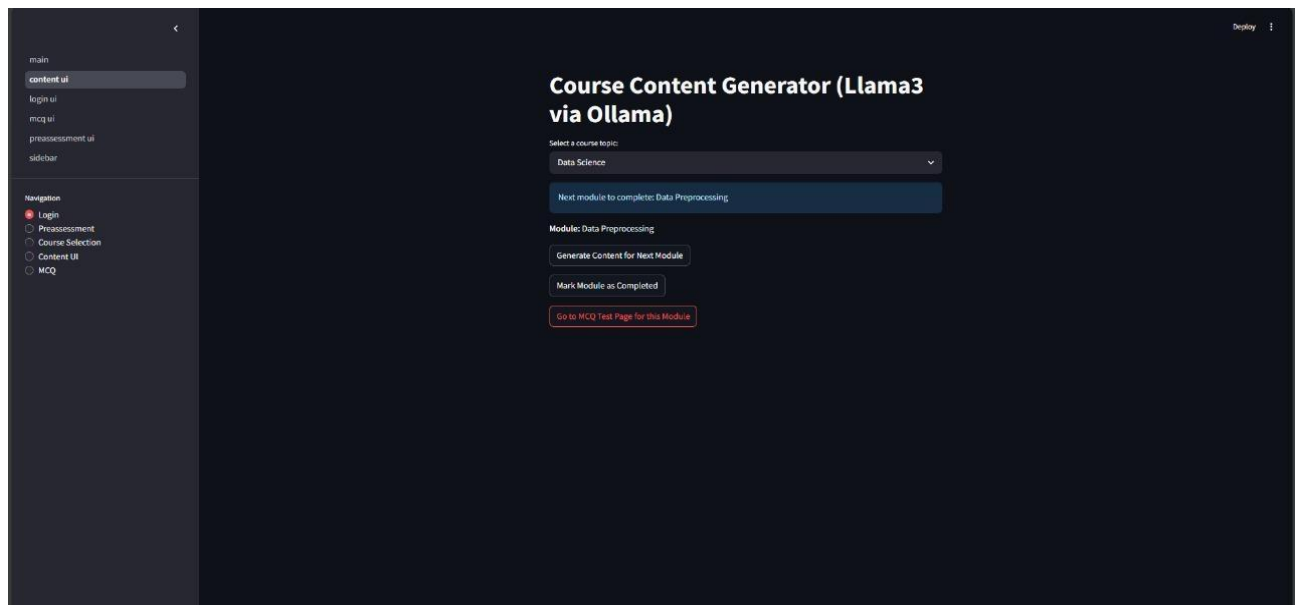


Fig 4: Selecting a Course name

Fig 3&4-

After user login with their respective credentials he have to select what type of course he wants to learn.

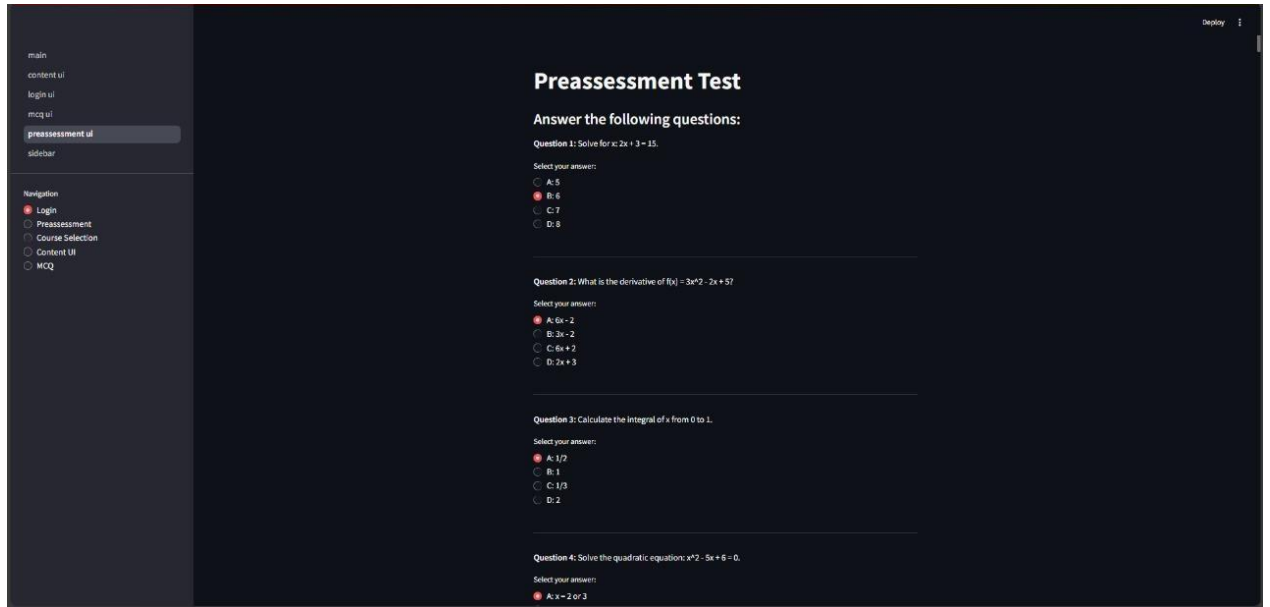


Fig 5: Preassesment Test

Fig 5-

After selecting course if he wants he will give an preassesment test so that he will get to know how much knowledge he have on that topic and where he can improve his skills on that particular topic..

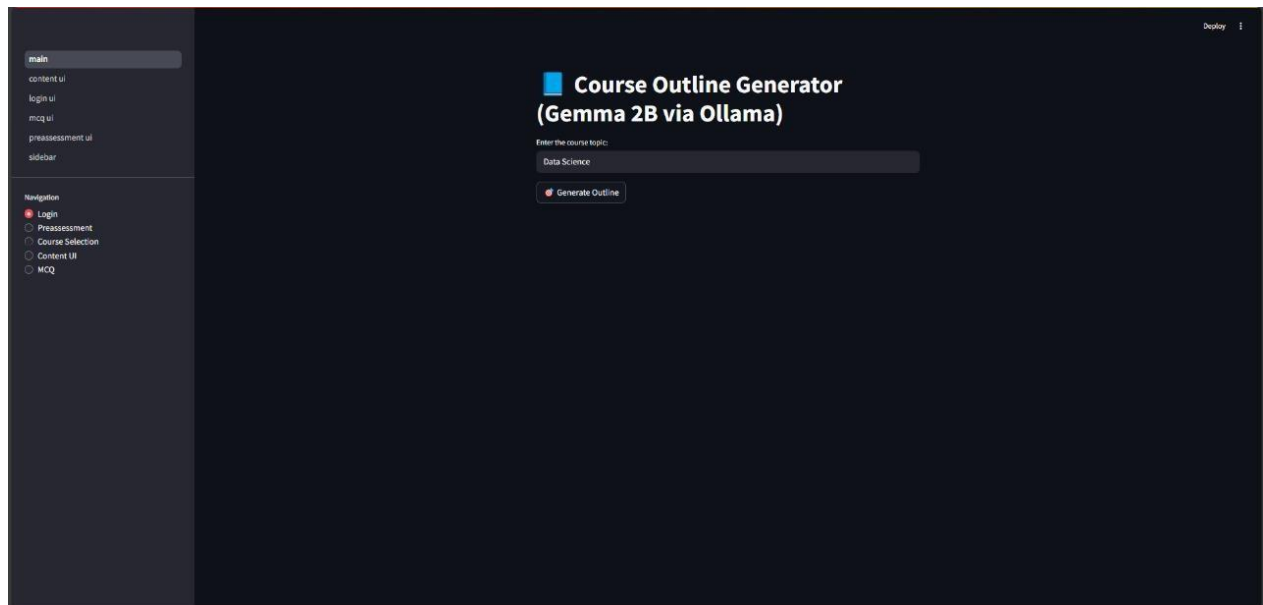


Fig 6: Course Outline Generator

Fig 6- Now the user will generate the course by entering what type of course.

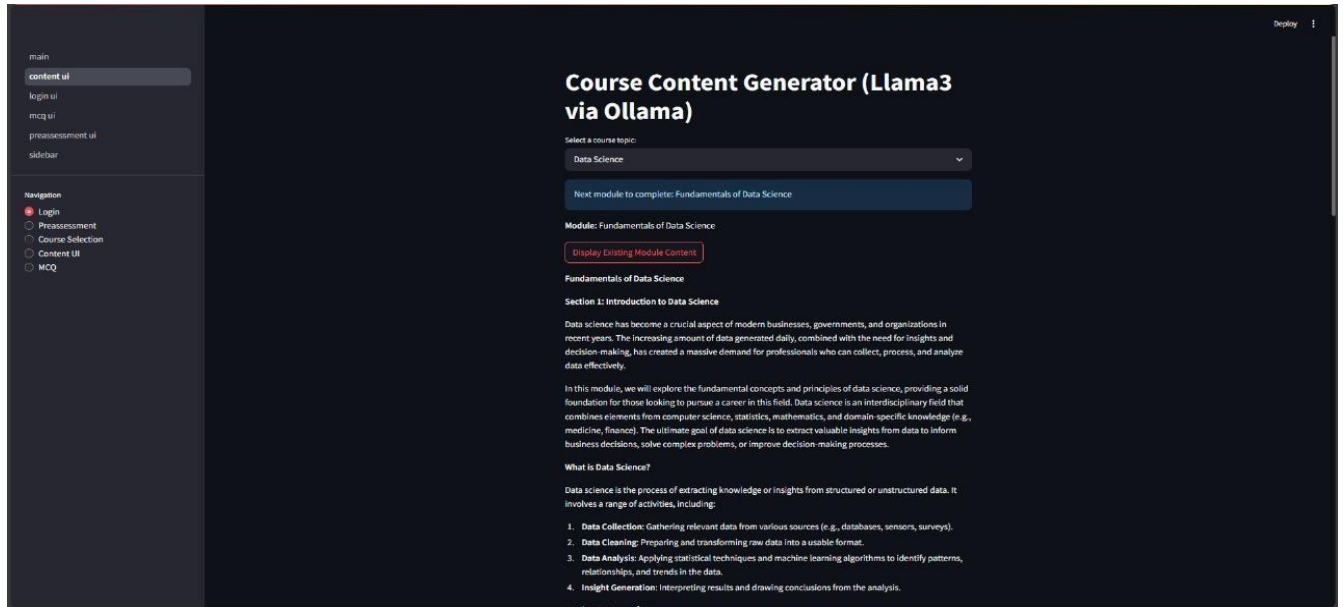


Fig 7: Course Generator

Fig 7- Here the course will generate content through Llama 3 via Ollama.

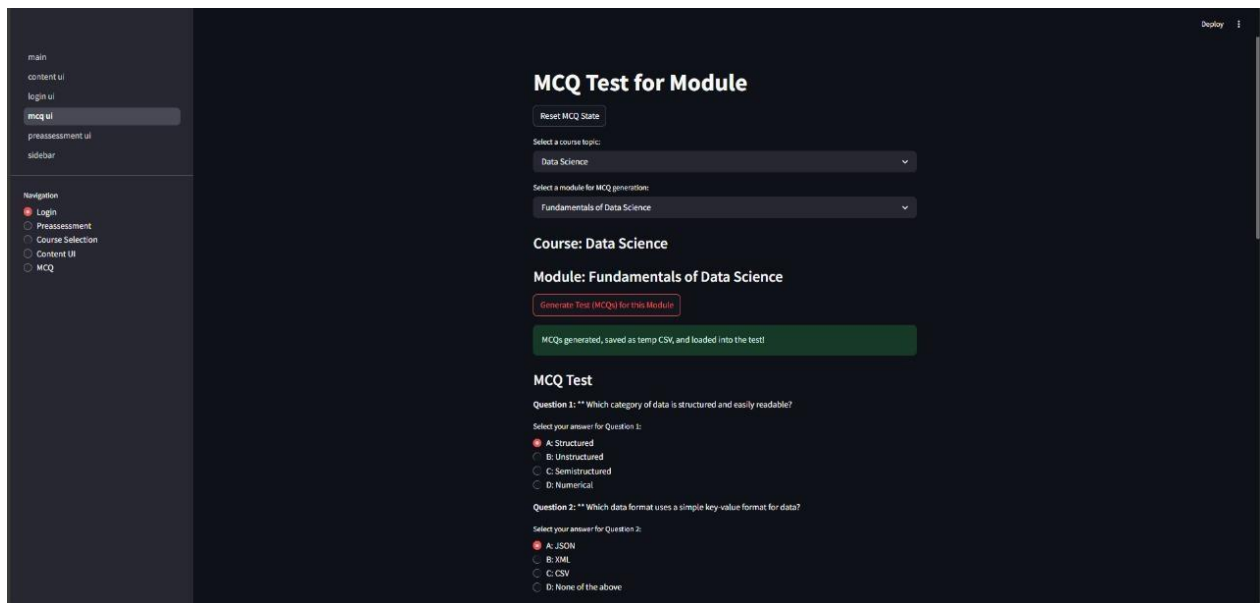


Fig 8: MCQ Test

Fig 8- After course completion the user will have a modules containing MCQ Test.

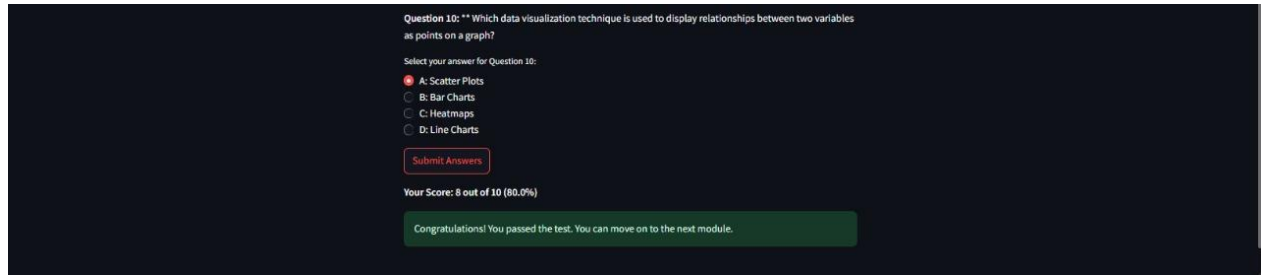


Fig 9: Completion of Module

Fig 9: After getting good marks in module then only you can do next module. To pass the module the user or learner has to score minimum of 80%.

7. CONCLUSION

Student Success brought us one such powerful representation of augmenting academia with AI which is the AI-Tutor. Through interactive assessments, immediate feedback, and AI-powered topic recommendations, the system adapts to the needs of each learner ML-Algorithms of AI-Tutor for students engagement & improving effectiveness of learning. There are many things to consider when designing the system including what data to collect, how well the AI model needs to perform and how users interact with the system. One adaptive learning platform that is built with scalability, security and real-time performance is the AI-Tutor. Despite the gain of this all, upcoming 3–10 developments can make AI-Tutor an all the more influential

Drive link for Screen Recording:
<https://drive.google.com/file/d/10rZpDlcigtzJFJDJSAbU9ePmswhTg7Lu/view?usp=sharing>

8. REFERENCES

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