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AI-Powered Learning Companion

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ABSTRACT

The AI-Powered Learning Companion is a smart educational tool designed to make studying easier and more engaging for students. It uses advanced Artificial Intelligence (AI) technologies to help students understand their lessons, answer their questions, and test their knowledge.

To achieve this, the tool uses powerful AI models like LangChain for answering questions. These technologies make the tool fast, accurate, and easy to use. The goal of this project is to improve learning for everyone. It works well for students learning in schools, colleges, or even online. By filling the gaps in traditional learning methods, this tool ensures that studying becomes more flexible, interactive, and fun. With the AI-Powered Learning Companion, education becomes more accessible and personalized, helping students succeed in their studies like never before.

1. INTRODUCTION

The AI-Powered Learning Companion is a special tool that makes learning easier and more fun for students. It uses smart computer technology called Artificial Intelligence (AI) to help students learn better. The tool does three main things:

1. Answer Questions Quickly – If students have doubts or questions, they can ask the tool, and it will give answers right away.
2. Create Personalized Quizzes – It makes quizzes that match what the student needs to practice.
3. Help with Study Materials – It can read PDFs, videos, and make them easier to understand.

This tool helps students learn at their own pace and makes studying less stressful.

Existing System

Traditional learning platforms, such as online courses or video-based lessons, have been helpful but come with some limitations:

1. No Real-Time Interaction
   - Most platforms only provide pre-recorded videos or static notes.
   - Students cannot ask questions and get answers immediately.
2. No Quiz Generation
   - Quizzes or practice tests are often general and not designed for what the student is studying.
   - There's no automatic way to create questions based on specific lessons or materials.
3. Limited Content Processing
   - Students cannot upload their textbooks, notes, or videos to get help.
   - Platforms don't explain uploaded content effectively.

As a result, current systems focus more on delivering content rather than making learning interactive and personalized.

Proposed System

The Proposed System is designed to solve the problems of existing learning platforms by offering

more advanced, personalized features. It will help students study more effectively with the help of AI.

2. REQUIREMENT ANALYSIS

Functional Requirements

The AI-Powered Learning Companion has two main types of modules:

1. User
2. System

User Module

1. Upload Video/PDF

- Users can upload their study materials in the form of PDFs or videos to the system.
- For example, a student can upload a PDF of their class notes or a video lecture they want to review.

2. Ask Question

- Users can ask questions based on the content they have uploaded, like asking for explanations or clarifications.
- For example, after watching a video about "Newton's Laws," a student might ask, "What is the third law of motion?"
- The system will process the content and provide an answer.

3. Quiz Participation

- Users can participate in quizzes generated by the system, which are based on the topics they are studying.
- This feature helps students test their knowledge and review what they've learned.
- For example, after studying a chapter on photosynthesis, the system will give a quiz on that topic.

4. View Report

- Users can view their performance reports, which show how well they did in quizzes and how much progress they've made.
- The reports help students identify areas they need to improve on, so they can focus their study efforts.

Non-Functional Requirements

- Performance:
  - Real-time response for Lecture Q&A.
  - Processes PDF's and generates questions.
- Usability:
  - Intuitive user interface for both students and admins.
- Maintainability:
  - Modular design for easy updates and maintenance.
  - Clear documentation for developers and users.
- Responsiveness:
- The system should handle user inputs and interactions with minimal delay.

Hardware Resources

Hardware Requirements are the most common set of requirements defined by any operating system or software application is the physical computer resources, also known as hardware.

- RAM: 4GB (Minimum)
- Processor: Intel i3 and above
- Hard Disk: 40 GB

Software Resources

The software requirements document is the specification of the system. It should include both the definition and a specification of the requirements. It is a set of what the system should do rather than how it should do it. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating cost, planning team activities, performing tasks and tracking the team's progress throughout the development activity.

- Operating System: Windows 10 and above
- IDE: VS Code

- Language: Python 3 and above
- Database: ChromaDB
- Framework: LangChain

3-DESIGN

Design represents the number of components we are using as a part of the project and the flow of request processing i.e., what components in processing the request and in which order. An architecture description is a formal description and representation of a system organized in a way that supports reasoning about the structure of the system.

Architectures

Project architecture represents number of components we are using as a part of our project and the flow of request processing i.e. what components in processing the request and in which order. An architecture description is a formal description and representation of a system organized in a way that supports reasoning about the structure of the system.

Software Architecture

Software architecture design tools help to build software that doesn't have security issues. This is key because there are software risks in all areas of the software development process. When teams avoid software flaws or bugs, they are able to move forward with confidence. However, since this isn't always possible, software architecture design tools also need to have the ability to find flaws during the creation of software and correct them efficiently. When using software architecture design tools that can identify flaws, you will have the ability to analyse the fundamental software design, assess the chance of an attack, figure out potential threat elements, and identify any weaknesses or gaps in existing security. When using software architecture design tools that can identify flaws, you will have the ability to analyse the fundamental software design, assess the chance of an attack, figure out potential threat elements, and identify any weaknesses or gaps in existing security.

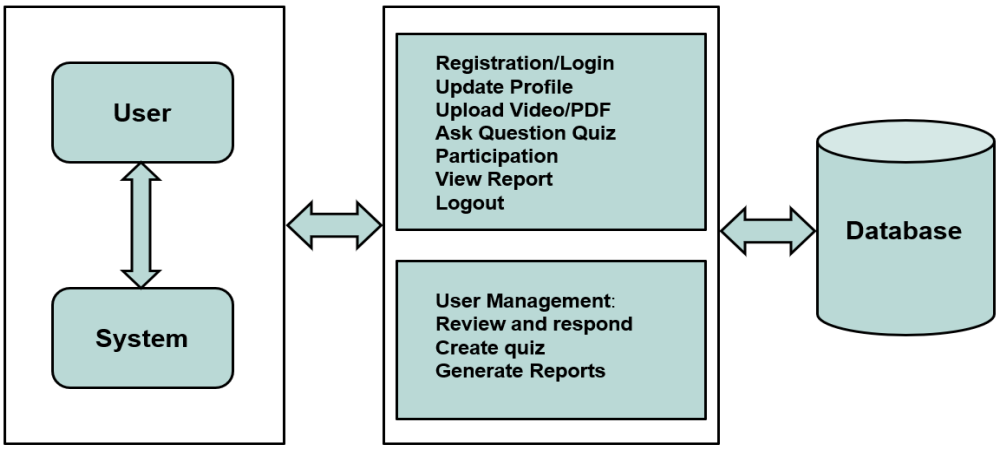


Fig.1 Software Architecture

Technical Architecture

Technical Architecture is a form of IT architecture that is used to design computer systems. It involves the development of a technical blueprint with regard to the

arrangement, interaction, and interdependence of all elements so that system-relevant requirements are met.

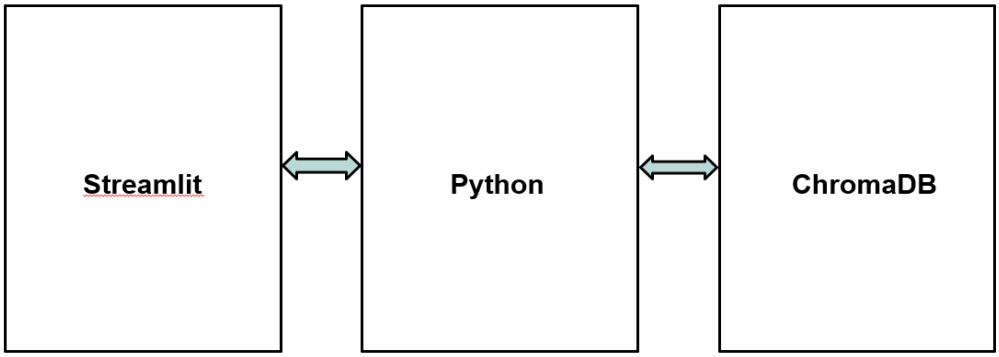


Fig.2 Technical Architecture

4-IMPLEMENTATION

The project uses modern technologies to provide advanced features and create a seamless user experience.

Python

- Purpose: Python is the primary programming language used to develop the project.
- Python is easy to learn and widely used for AI and machine learning projects.
- It has powerful libraries and frameworks for handling data, natural language processing, and building user-friendly interfaces.
- It is used for:
  - Developing the backend logic for processing user inputs (PDFs, videos, questions).
  - Integrating AI models for Q&A, transcription, and quiz generation.
  - Building the interface using frameworks like Streamlit for ease of use.

LangChain

- Purpose: LangChain is used to process questions and provide answers from the uploaded PDFs or lecture videos.
- It simplifies working with large language models like OpenAI's GPT.
- Helps connect the AI model with the system's data sources (e.g., PDF content, transcriptions).
- It is used for:
  - To analyse the content of PDFs or lecture transcriptions.
  - When users ask questions, LangChain processes the query, retrieves relevant data from the content, and generates an accurate response.
  - Ensures the Q&A feature is fast and reliable.

OpenAI Whisper

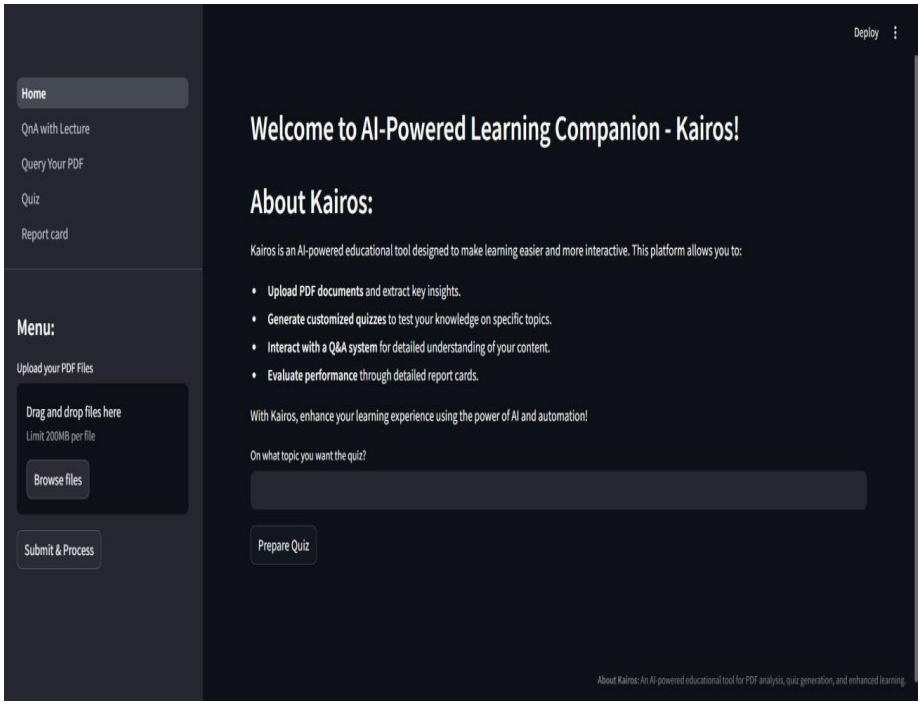
- Purpose: Converts lecture videos into text (transcriptions).
- It's an advanced AI model for speech-to-text processing.
- Highly accurate and supports multiple languages.
- It is used to process audio from videos to create transcriptions, which are then used for Q&A or quiz generation.

Streamlit

- Purpose: Creates the user interface for the system.
- It allows quick development of interactive web applications.
- Simple to use and integrates well with Python.
- It is used to provide a clean interface for uploading PDFs/videos, asking questions, taking quizzes, and viewing reports.

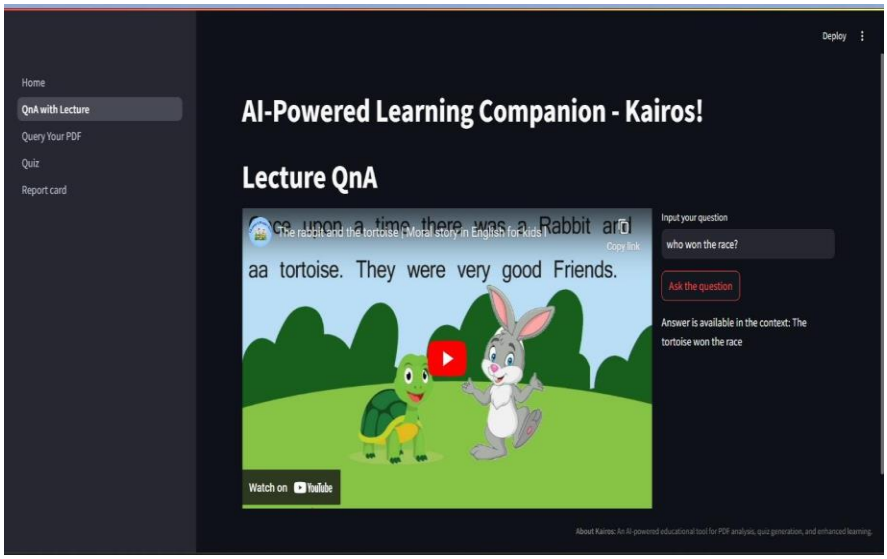
5-RESULTS

Home Page



Screenshot 1 Home Page

Q & A with Lecture



Screenshot 2 Q & A with Lecture

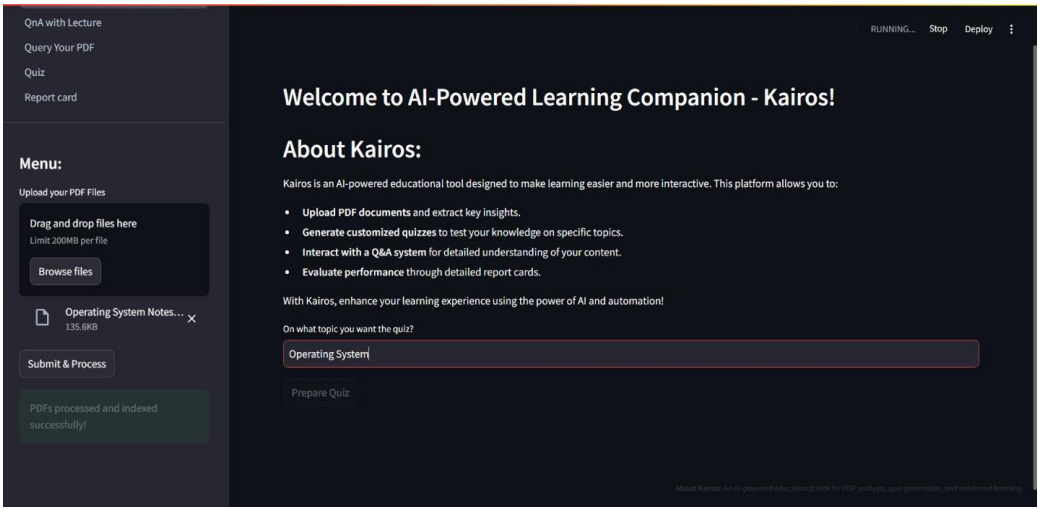
Query Your PDF

Screenshot 3 Query Your PDF

Ask a Question

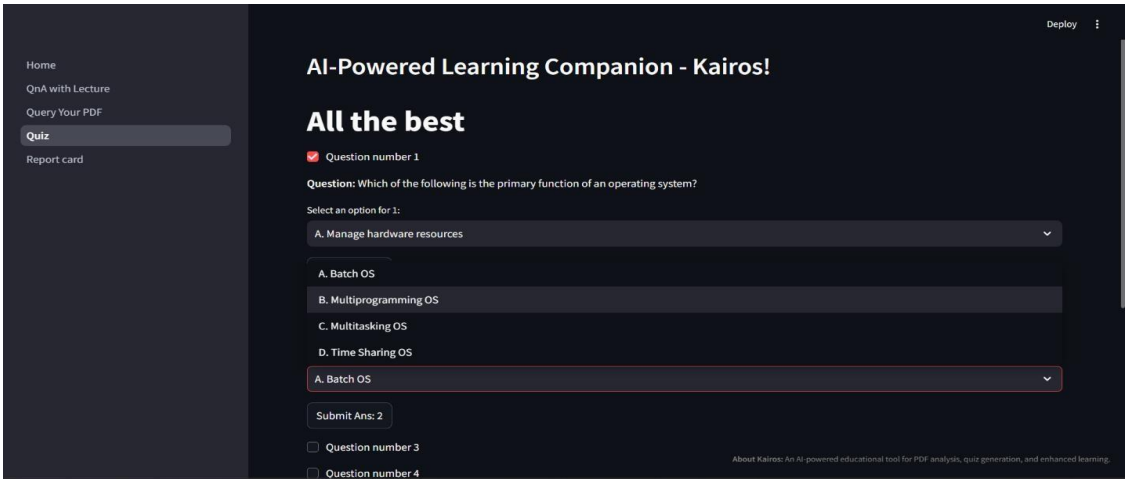
Screenshot 4 Ask a Question

Generate Quiz



Screenshot 5 Generate Quiz

Quiz Questions



Screenshot 6 Quiz Questions

6-CONCLUSION

The AI-Powered Learning Companion successfully addresses the challenges of traditional learning systems by integrating advanced artificial intelligence to provide an interactive, and efficient learning experience. The system enables students to upload educational content, ask questions, generate quizzes, and track their progress seamlessly.

By using features such as real-time Q & A, dynamic quiz generation, and performance reporting, the platform bridges the gap between passive learning and active engagement. It has been designed to meet the

diverse needs of students, ensuring accessibility, usability, and scalability.

The project demonstrates the potential of AI in transforming the educational landscape by empowering learners with tools to enhance their understanding, retention, and academic performance.

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