Learn Smart AI

Project Documentation

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Live App:

`https://learn-smart-ai-27284509195.us-west1.run.app/`

GitHub Repository:

`https://github.com/pranjalparmar/Learn-Smart-AI`

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Contents

1 Introduction

Learn Smart AI is an AI-powered web application that transforms lecture notes and study materials into interactive concept maps, exam-focused flashcards, and practice Q&A—within seconds.

This project aims to address a common student challenge: turning dense class notes into effective, personalized study resources. Instead of spending hours rewriting and summarizing, students can now simply upload their notes as PDF, DOCX, PPTX, or TXT files. The app quickly generates:

- A dynamic concept map showing all major topics and their connections,
- A set of editable, AI-generated flashcards,
- Practice questions covering both knowledge recall and real-life scenarios,
- Tools to track their study progress.

Learn Smart AI is built to be user-friendly and accessible: no sign-up or login is necessary. Its main goal is to make the study process smarter, more engaging, and much more efficient by using artificial intelligence.

2 Key Features

Learn Smart AI offers a range of features designed to help students learn efficiently and actively:

- **One-click access:** Start using the app immediately—no registration or login required.
- **Multi-format file upload:** Upload study materials in PDF, TXT, DOCX, or PPTX formats.
- **Dynamic concept maps:** Visualize your materials as interactive maps that highlight main and sub-topics.
- **AI-generated flashcards:** Get a set of editable, exam-focused flashcards created automatically from your notes.

- **Ask Anything:** Ask any question about your uploaded document and receive instant, AI-powered answers to clear up doubts or explain concepts in detail.
- **Q&A Practice:** Practice with a curated set of questions covering both factual knowledge and scenario-based application to help you understand and use the material in real-world contexts.
- **Mini-game while you wait:** While your file is being processed, play a quick, educational mini-game to focus your mind and prepare for study.
- **Progress tracker:** See which questions or flashcards you've mastered, missed, or still need to practice.
- **Edit and export:** All content—maps, flashcards, questions—can be edited, reworded, or removed. Export your customized materials as PDF or CSV for offline study.
- **Mobile friendly:** Use the modern, fully responsive interface on desktop or mobile devices.

3 Technology Used

Learn Smart AI uses a collection of modern and powerful technologies to deliver a smooth, intelligent learning experience:

- **Frontend:** Built with React and TypeScript for a fast, interactive, and maintainable web interface.
- **AI Service:** Integrates with Google AI Studio's Gemini LLM API to understand, summarize, and generate learning materials from user uploads.
- **Cloud Hosting:** The app is hosted on Google Cloud Platform, which provides high reliability, security, and scalability.
- **Architecture Diagrams:** Project structure and designs are visualized using Structurizr.
- **Development Toolkit:** Uses Vite for speedy web development and a modern code structure.

4 System Architecture

Learn Smart AI is structured using the C4 model, making each part of the system clear and understandable:

- **User:** The student who uploads their study files and uses the app's learning features.
- **Web Application (SPA):** The main website, built with React and TypeScript, where users access all study tools.
- **Google Gemini LLM API:** The AI service that processes notes and generates smart study aids.

How the system works:

1. The user opens the web app and uploads a study file (PDF, DOCX, PPTX, or TXT).
2. The app sends the file securely to the Google Gemini LLM API.
3. The AI analyzes the material and creates:
   - A concept map,
   - Editable flashcards,
   - Practice questions (both knowledge-based and real-world scenarios).
4. The app displays these results for the user to review, edit, practice, or export.
5. All files and data are kept private and secure at all times.

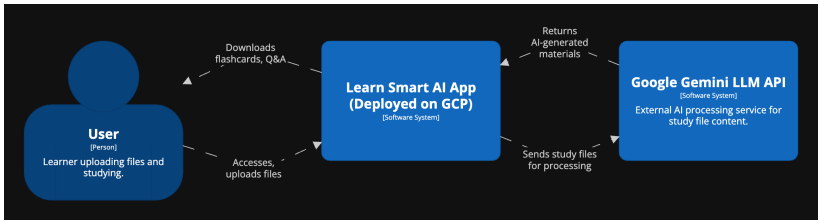

Figure 1: System context diagram

For a deeper look at how each part is organized, see the additional container, component, and deployment diagrams in the separate C4 documentation PDF.

5 How to Use and Deployment

Learn Smart AI is designed to be easy to use, with no setup needed for students. Here's how you can get started:

1. **Open the App:** Visit the live site at `https://learn-smart-ai-27284509195.us-west1.run.app/`. No registration or login is required.
2. **Upload Your Material:** Add your lecture notes or study materials in PDF, DOCX, PPTX, or TXT format.
3. **Explore the Results:** The app instantly creates a concept map, flashcards, and Q&A based on your material.
4. **Edit and Personalize:** You can reword, remove, or add to any map, card, or question.
5. **Practice and Track Progress:** Use the in-app stats to monitor your learning and see which topics you've mastered.
6. **Export for Offline Study:** Download your flashcards and Q&A as PDF or CSV files.

Deployment and Project Structure:

- The app is hosted on Google Cloud Platform for speed and security.
- All file processing happens in the browser or securely through Google AI Studio—no user accounts or database are needed.
- Code is organized into separate folders for components, services, and types for easier development and maintenance.
- The project uses React, TypeScript, and Vite for a responsive and modern web experience.

6 App Walkthrough

Below is a step-by-step visual and functional walkthrough of Learn Smart AI's main features.

1. **Home Page**
   The opening screen welcomes users. No sign-up or login required—just start learning.

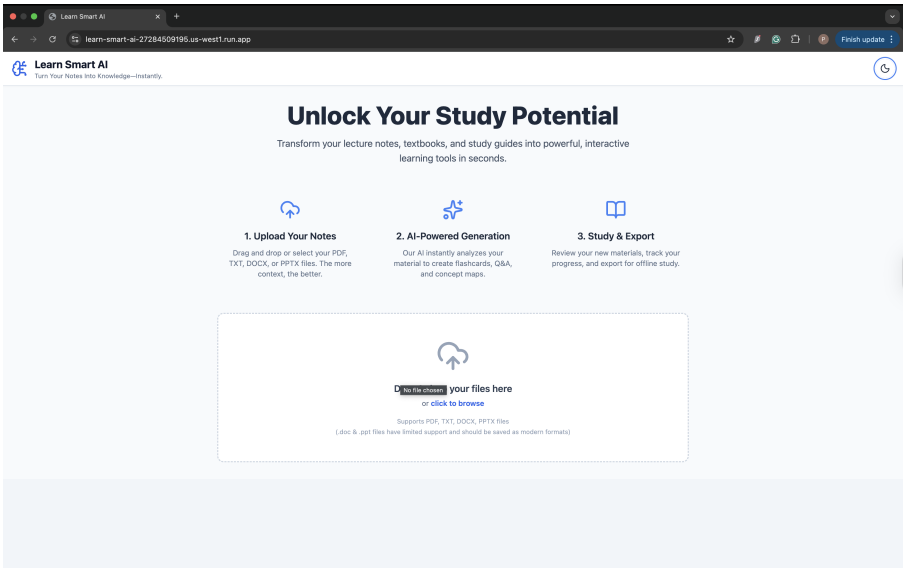

Figure 2: Learn Smart AI Home Page

2. **Mini Activity: Trivia Game While Processing**
   While the app generates your materials, play an engaging trivia activity to focus your mind.

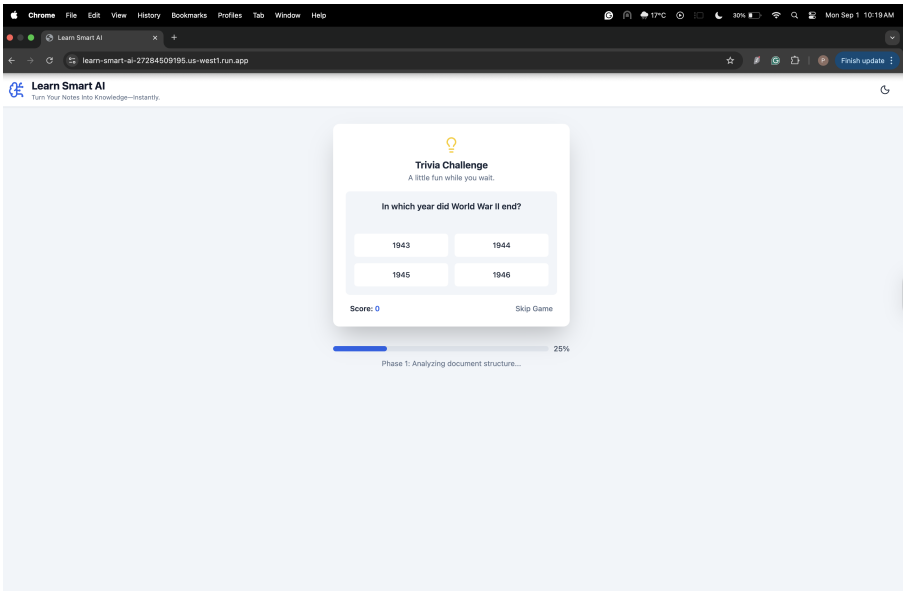

Figure 3: Educational mini-game or trivia while file processes

3. Concept Map

The app presents an interactive concept map showing key topics and connections in your study material.

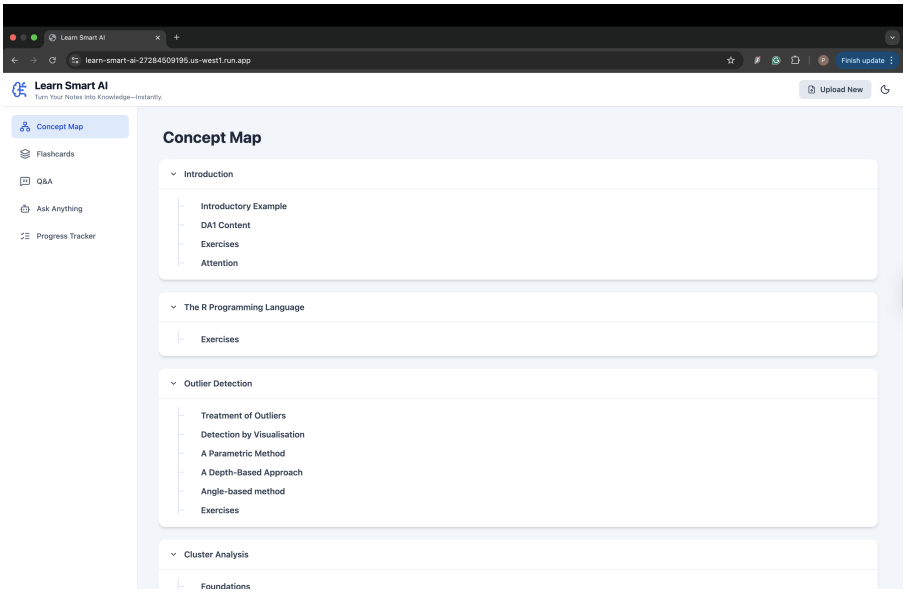

Figure 4: AI-generated interactive concept map

4. Flashcards

A set of editable flashcards is generated automatically for smart revision and self-testing.

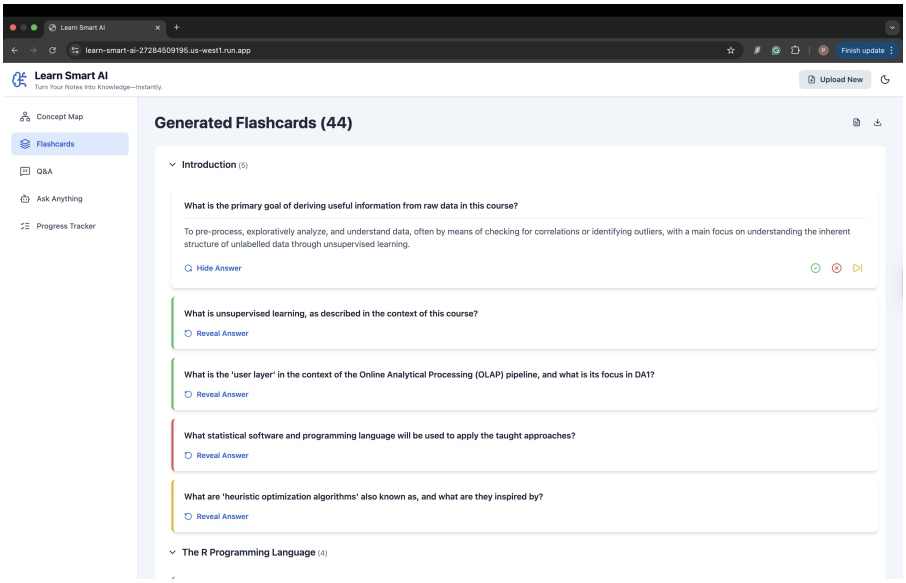

Figure 5: Auto-generated flashcards, ready to review or edit

5. Q&A

The platform prepares knowledge-based and scenario-based questions to practice and assess understanding.

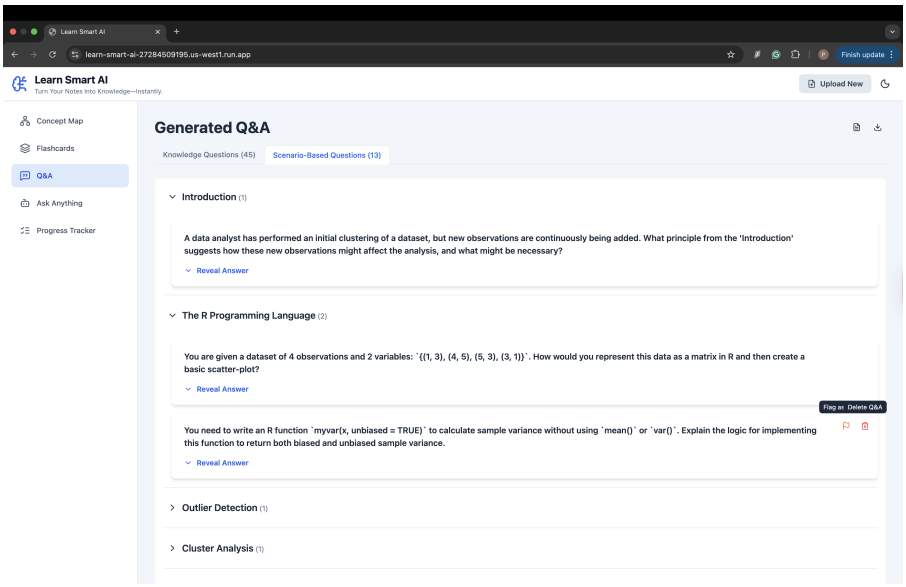

Figure 6: Practice Q&A for comprehensive exam prep

6. Ask Anything

Users can ask any question about their material and get instant, AI-powered explanations or clarifications.

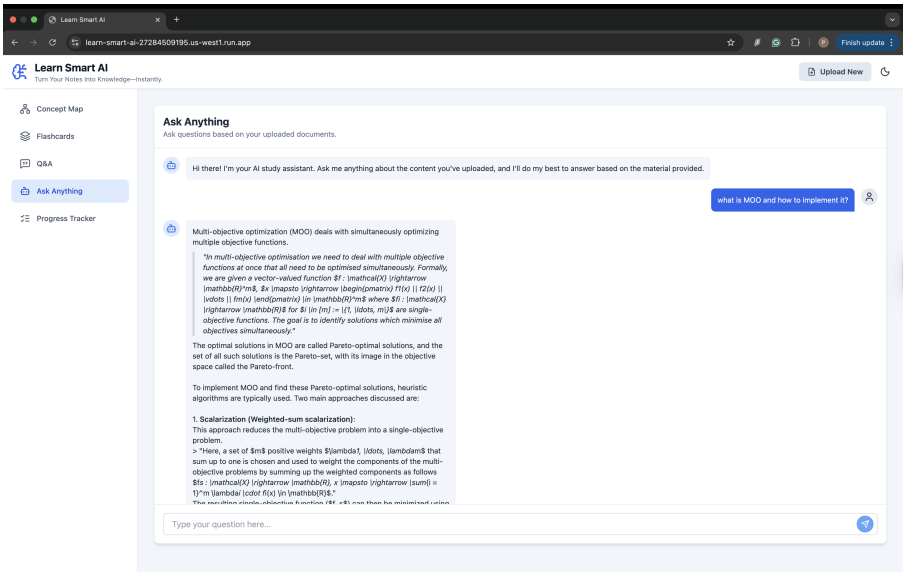

Figure 7: Ask Anything: Chat-style instant answers about your material

7. Progress Tracker
Track which flashcards and questions you've mastered or need to review, with visual progress indicators.

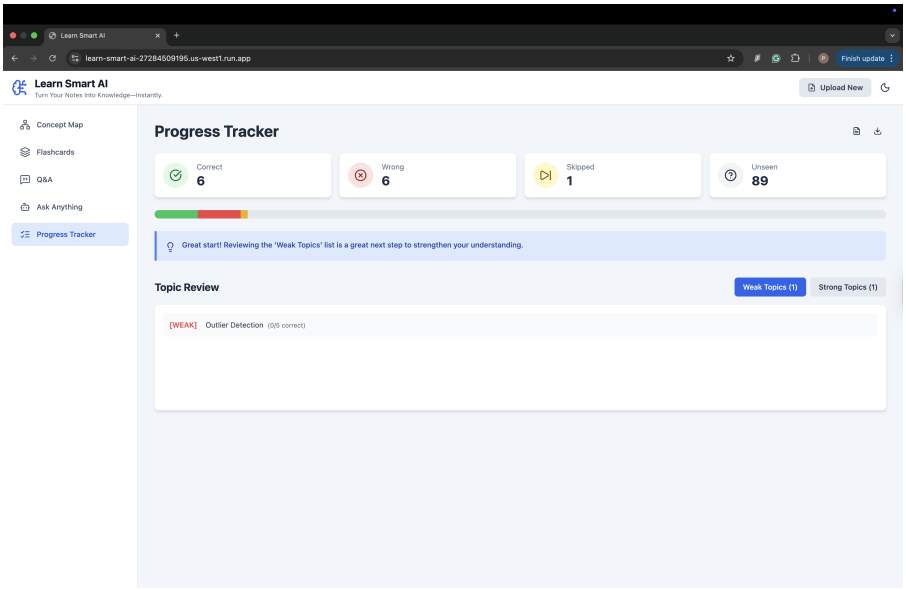

Figure 8: Progress Tracker: Visual study analytics

8. Export PDFs/CSVs
Customize, save, and export any flashcard set or Q&A to PDF or CSV for offline use.

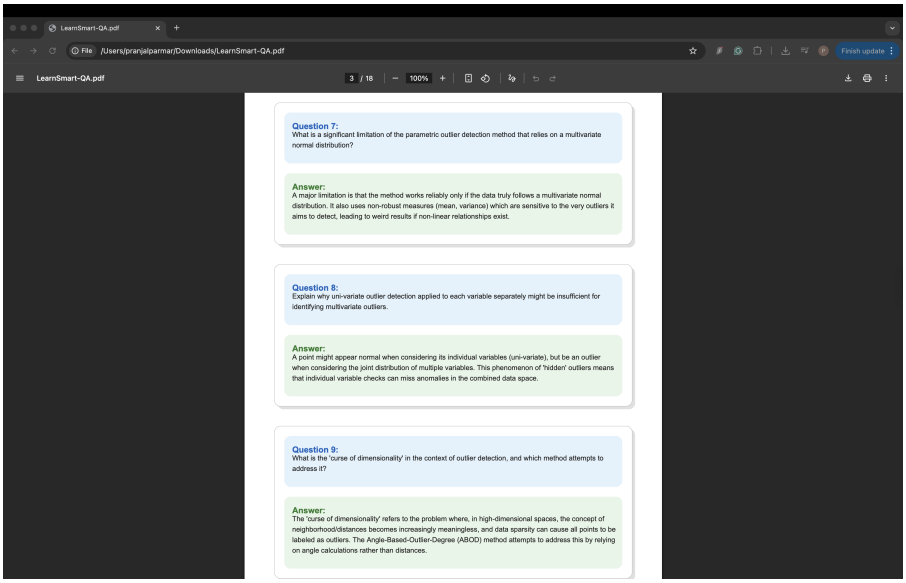

Figure 9: Export customized study aids to PDF or CSV

7 Conclusion and Future Work

Learn Smart AI makes studying faster, simpler, and more effective by turning ordinary notes into interactive learning tools in seconds. By combining a modern web interface with Google Gemini LLM AI, the app transforms uploaded files into concept maps, flashcards, and targeted practice questions—no manual work required. Users can access all features instantly, without creating an account.

Future improvements may include:

- Adding support for more file types and languages.
- Building a collaborative mode so users can study together.
- Introducing an Exam Mode where users can take personalized practice exams generated from their study materials.

This project demonstrates the power of AI for smart, student-centered learning—and offers plenty of opportunities for further development.

8 References

1. **Google AI Studio and Gemini API Documentation:** https://ai.google.dev/
2. **React Documentation:** https://react.dev/
3. **TypeScript Documentation:** https://www.typescriptlang.org/
4. **Vite Documentation:** https://vitejs.dev/
5. **Structurizr C4 Model Documentation:** https://c4model.com/
6. **Learn Smart AI GitHub Repository:** https://github.com/pranjalparmar/Learn-Smart-AI