

SmartCourse: Course Selection System with AI Suggestion Module

Introduction:

SmartCourse is an intelligent course selection platform that simplifies scheduling by offering personalized recommendations based on students' academic history, major, and four-year plans. It uses an on-premises LLM (DeepSeek-r1:1.5b via Ollama) for scalable guidance and includes role-based access, real-time enrollment, and email notifications. The system has a dual UI (CLI for testing, Gradio for daily use) and a modular design for easy updates and minimal deployment footprint. SmartCourse aims to streamline advising, improve student satisfaction, and provide instructors with data insights.

Advantages:

1. AI-Powered Guidance – Combines course registration with an on-premise AI adviser, turning enrollment into a data-driven mentoring experience.
2. Lightweight & Modular – Uses a Python codebase with plain-text storage, eliminating the need for heavy databases or cloud subscriptions, while allowing easy migration to SQL/REST.
3. Dual UI for Flexibility – CLI for quick admin tasks and Gradio for a modern web interface, ensuring accessibility with role-based permissions.
4. Automated Notifications – Email alerts keep students and instructors updated without manual follow-ups.
5. Centralized Logging – Simplifies auditing and tracking of system activity.
6. Cost & Privacy Benefits – Local AI (via Ollama) avoids external API costs and enhances data security.
7. Improved Efficiency – Reduces advising bottlenecks while providing personalized scheduling.
8. Easy Maintenance – Modular design ensures sustainable usability and straightforward updates.

Structure:

Layered architecture: UI layer (CLI & Gradio) routes requests to the CourseManager core; CourseManager manipulates domain models (Student, Instructor) and persists to lightweight TXT files. The AI engine (Ollama-served LLM) and SMTP email service are plug-in side modules, invoked through clean interfaces, so they can be swapped without touching core logic.

Contribution:

- Yixuan Mi: Designed and implemented the core system logic and course management functions, ensuring seamless user operations.
- Yiduo Yu: Developed the user and course data models and built the graphical user interface using Gradio.
- Yiyi Zhao: Implemented the email notification and logging system, and developed the AI-based academic recommendation module.

Similar Works on GitHub:

Project1: Course Management System

- Link: <https://github.com/DataTalksClub/course-management-platform>
- Introduction: A Django web app for Zoomcamp courses enabling instructors to create courses, assignments, and peer-review tasks while students enrol, upload homework or projects, and evaluate peers. Features standard role-based access, dashboards, and grading workflows geared toward cohort-based online learning; no built-in AI or recommendation engine.
- Comparison to our project: SmartCourse integrates a local LLM for personalized course advising, sends SMTP email alerts, and persists data in simple TXT files for ultra-light deployment. DataTalksClub focuses on assignment delivery and peer review within a full Django stack. Thus, SmartCourse excels in AI guidance and minimal infrastructure, whereas DataTalksClub offers richer assessment tooling.

Project2: Student Course Selection Information Management System

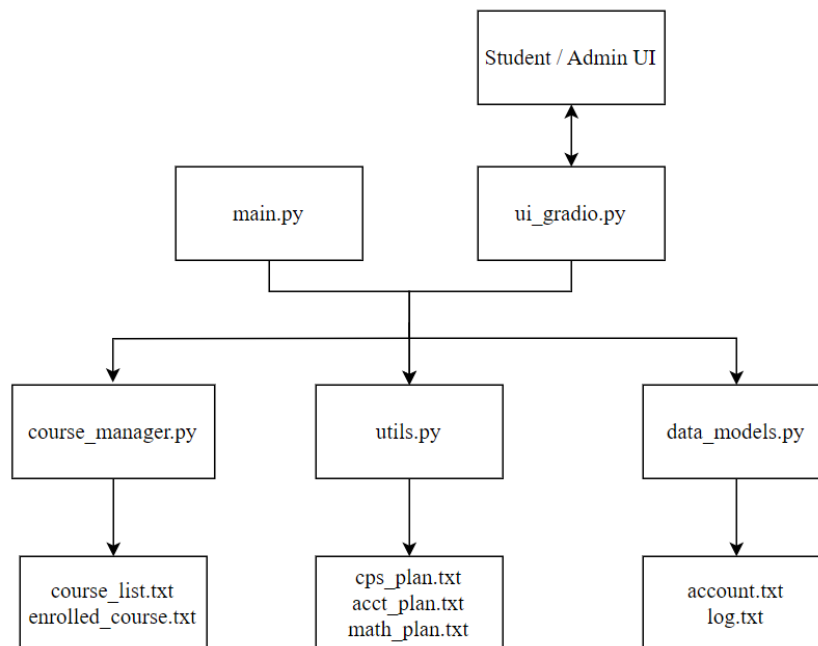
- Link: <https://github.com/ningzichun/student-management-system>
- Introduction: PHP 7 / MySQL web app for universities that records detailed student profiles, manages departments, courses, enrolment, grading (including re-exams), awards & penalties, and generates statistics or printable reports. It offers admin vs. student roles and CRUD dashboards but no AI components or automated email integration.
- Comparison to our project: SmartCourse is Python-based, persisting to lightweight TXT files and embedding a local LLM for personalized course-advising plus SMTP alerts; ideal for rapid deployment and AI-driven guidance. This system runs on PHP/MySQL, emphasizing rich database CRUD and reporting yet lacks recommendation intelligence, offline usability, and built-in notification services.

Project3: Laravel Learning Management System

- Link: <https://github.com/Mazbaul/Online-Learning-And-Course-Management-System>
- Introduction: Laravel-based mini LMS built with QuickAdminPanel and AdminLTE. Supports course, lesson, user, exam and result management plus Stripe payment integration and question-and-test modules. Role-based dashboards let admins add content while students enrol and take assessments. Focuses on CRUD and e-commerce; no built-in AI or notification engine.
- Comparison to our project: SmartCourse emphasizes personalized AI advising via an on-premise LLM, lightweight TXT persistence, and SMTP email alerts for enrolment and grading. The Laravel LMS offers richer assessment and payment features but lacks recommendation intelligence and requires a full PHP/MySQL stack. Thus, SmartCourse excels in guided course selection and minimal deployment overhead.

Model:

Block diagram:

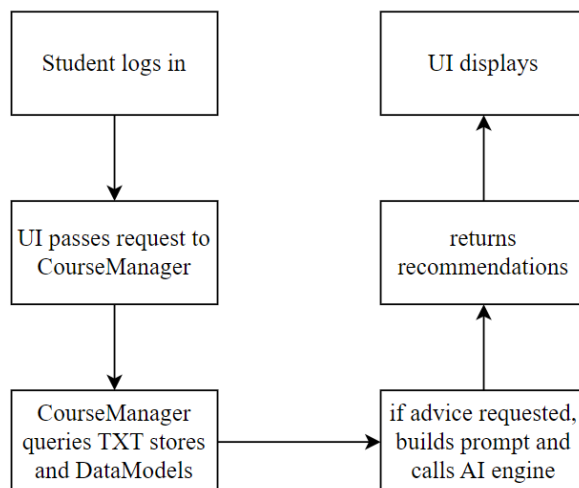


The diagram visualises a layered architecture: CLI (`main.py`) and Gradio UI (`ui_gradio.py`) sit atop the core modules. `course_manager.py` orchestrates domain logic, invoking utility services (`utils.py`) and data models. TXT files act as lightweight persistence. Unidirectional arrows show call directions; double arrows denote read-write.

How we built it:

Implemented with pure Python for portability. We isolated concerns: domain classes in `data_models.py`; business rules in `course_manager.py`; I/O helpers in `utils.py`. Interfaces expose simple functions, letting CLI and Gradio reuse identical logic. AI queries travel through a single `ask_ai_question` wrapper, so swapping models needs no refactor.

Flow of work:



Results:

Highlight Technical Advantage:

Runs an on-premise LLM for instant, private AI advising; zero-DB TXT storage enables one-click deployment; shared logic layer guarantees parity between CLI and web UI; SMTP hooks automate notifications; clean interfaces let any module (AI, email, persistence) swap without touching core code.

Visual Results (Examples):

Main menu:

SmartCourse Management System

Welcome, mjy@kean.edu!

Student Menu

| |
|-------------------|
| Enroll in Course |
| View My Courses |
| Drop Course |
| Ask AI for Advice |
| Logout |

AI recommendation:

****Seeking Academic Advice from AI: ****

your problem

Based on my current transcript and my four-year plan, can you give me some advices?

Question AI

AI ADVICE:

Based on the current transcript and four-year plan, here is a structured advice for your academic journey:

1. Academic Preparation:

- **Strengths:** Your course history shows strong preparation in computer science, particularly with foundational courses like CPS1231 and upper-level courses such as CPS4982 (Big Data Analysis) and CPS4981 (Introduction to Deep Learning). You also have relevant math courses covering Calculus II, Probability, Statistics, and Applied Statistics.
- **Needs:** If your degree requires specific minors or a different program than CS, ensure you meet any additional math requirements.

2. Four-Year Plan:

- The plan aligns well with a career in technology, though it might be beneficial for exploring data science as an interest. Flexibility in electives allows you to focus on what excites you most.
- The mix of programming courses (CPS3962, CPS3410) and applied math (MATH2400, MATH2995, MATH3700) is advantageous for tech-related fields.

3. Future Steps:

- Consider additional math courses if your degree requires them for minors or majors.
- Explore advanced programming or AI/ML projects in electives like CPS3962 or a CS-related research project.
- Join clubs related to computer science to network and gain insights from professionals.

Comparative Advantage:

Against peer projects, SmartCourse uniquely merges real-time AI guidance with native course workflow and email alerts, delivering actionable advice—not just CRUD management—while avoiding heavyweight stacks. Competitors lack integrated intelligence or require complex LAMP/Django setups; SmartCourse offers smarter decisions with lighter infrastructure.