CS256: Topics in AI

Homework Group Project - AI Knowledge Hub

System Design Document

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1. Overview

This document outlines the architecture and technology stack used in the project. The system is designed to provide a web-based application with a modern, responsive frontend, a robust backend using Python and Flask, and a persistent storage solution managed through SQLAlchemy with SQLite3. Continuous integration and deployment are facilitated through Render, while Git and GitHub manage source control and repository hosting.

2. System Architecture

2.1. Frontend

- **Technologies:** HTML, CSS, JavaScript, Tailwind CSS
- **Role:**
  - Provides the user interface and interactive client-side experience.
  - Tailwind CSS is utilized to build responsive and modern designs quickly.
  - JavaScript enhances interactivity and dynamic content rendering.

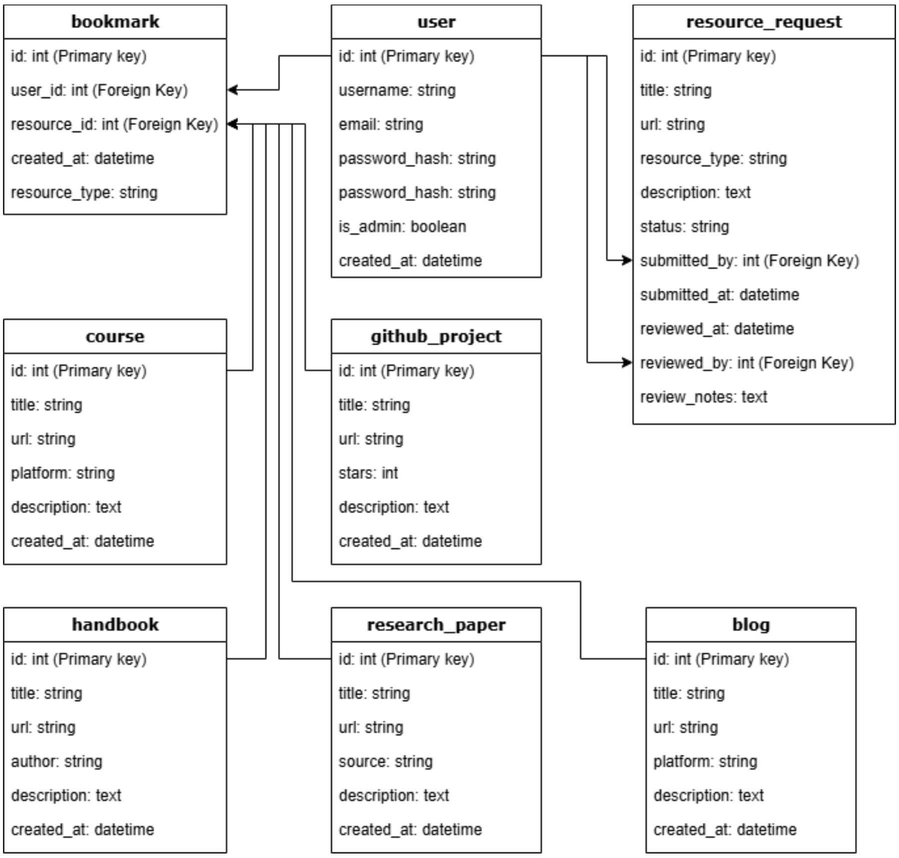
2.2. Backend

- **Technologies:** Python, Flask
- **Role:**
  - Serves as the core application server.
  - Handles HTTP requests, processes business logic, and manages API endpoints.
  - Implements server-side functionalities like authentication, routing, and data processing.

2.3. Database

- **Technologies:** SQLAlchemy (ORM), SQLite3
- **Role:**
  - SQLAlchemy abstracts the database operations, enabling easier manipulation of data objects.
  - SQLite3 is used as the underlying relational database to persist application data.
  - The database schema includes multiple entities (e.g., User, Course, Handbook, GitHubProject, ResearchPaper, Blog, ResourceRequest, Bookmark) with defined relationships, as illustrated in the schema diagram below.

Database Schema Diagram:



2.4. Continuous Integration and Continuous Deployment (CI/CD)

- **Technology:** Render
- **Role:**
  - Automates the build, testing, and deployment processes.
  - Ensures that every code change is integrated, tested, and deployed seamlessly.

2.5. Source Control and Repository

- **Technologies:** Git, GitHub - CS256-AIGroupProject
- **Role:**
  - Git manages version control to track changes in the codebase.
  - GitHub serves as the remote repository, enabling collaboration, code reviews, and issue tracking.

3. Deployment Strategy

- **Environment Setup:**
  - The application is deployed on Render, which manages the runtime environment, scaling, and deployment.
  - The CI/CD pipeline ensures that any new code commits trigger automated tests and deployment.
- **Maintenance:**
  - Continuous monitoring on Render helps maintain system performance and uptime.