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Campus Heaven 2.0: AI-Based Final Deployment Of A Student Accommodation And Services Hub

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Abstract: Campus Heaven is an AI-powered student accommodation and services hub built using Flask as its core web framework, SQLite as the backend storage engine, and lightweight, rule-based logic to implement natural language understanding and review analysis features. The platform supports student interaction with various service categories including Accommodations, Gyms, Libraries, and Meal Services. It provides user-friendly tools for students to browse and evaluate available listings, submit open-ended reviews, and receive AI-generated responses to their concerns through an integrated chatbot.

All student reviews are logged and processed using a sentiment and sarcasm detection mechanism. Chat interactions are classified into defined support categories using a similarity-based intent-matching approach. Administrative users can view detailed analytics through dashboards that visualize user sentiments and support issues. These insights are also exportable via a downloadable PDF report, providing a complete and accessible summary of service performance and user engagement trends.

Index Terms **- AI Chatbot, Student Services, Sentiment Analysis, Accommodation System, Flask, SQLite**

I. INTRODUCTION

The second phase of the Campus Heaven project focused on implementing the complete functionality of the platform as originally envisioned. This includes integrating intelligent features such as chatbot support, review sentiment and sarcasm analysis, dynamic analytics dashboards, and PDF report generation. The platform now supports end-to-end management for student services across four key categories: Accommodations, Gyms, Libraries, and Meal Services. With these modules in place, students can seamlessly browse services, submit meaningful feedback, and receive AI-based assistance, while administrators gain data-driven insights into student experiences.

II. LITERATURE REVIEW

The growing demand for student accommodations has spurred the development of various platforms to assist college students in their housing searches, typically focusing on available room listings. Many of these platforms, however, are beginning to incorporate additional services to enhance user experience.

Roommates.com allows users to find roommates and available housing but primarily focuses on accommodations, lacking comprehensive meal and service listings. While it facilitates roommate searches, it does not provide a holistic solution for students seeking additional services. Similarly, CollegeRentals.com targets college students with a database of rental properties, enabling users to filter listings by price, location, and amenities. However, it primarily centers on housing, failing to address integrated needs such as meal services and essential resources.

Innovative platforms like Student.com utilize AI-driven recommendation systems to suggest accommodations based on user preferences and historical data, personalizing the search experience. However, they still fall short of providing comprehensive meal services and local business integration. Additionally, the concept of dynamic pricing, explored in the hotel and travel industries, optimizes rates based on real-time demand. Yet, few student housing platforms have successfully implemented this model, presenting a development opportunity.

Existing systems reveal a significant gap in fully integrating housing, meals, and local services into a user-friendly platform. While many solutions address specific student needs, there is a clear opportunity for a comprehensive marketplace that leverages AI to enhance user experience and service accessibility.

Many studies focus on user authentication processes for web-based applications, exploring methods such as email-based verification, two-factor authentication (2FA), and OAuth to enhance security. Research also highlights the importance of user-friendly profile management systems that allow users to update personal information and preferences, improving personalization and overall user experience.

Search algorithms and recommendation systems play a crucial role in improving accommodation searches. Studies emphasize collaborative filtering, content-based filtering, and hybrid recommendation models, which have been widely implemented in platforms like Airbnb and Booking.com to help users find accommodations based on previous preferences and behaviors.

Additionally, literature highlights the significance of user-centric search interfaces that provide filters, location-based results, and real-time availability, all of which directly impact user satisfaction. Research also discusses how offering additional services such as meal plans, laundry, and Wi-Fi connectivity enhances user experience and increases platform engagement. Studies further suggest that allowing users to personalize services based on their preferences, such as selecting meal plans or facilities, plays a significant role in user retention and satisfaction.

A seamless booking and cancellation process is another crucial aspect, as research indicates that user experience is often impacted by ease of booking confirmation, cancellation policies, and refund processes. Literature on cancellation policies suggests that flexible and transparent policies lead to higher user trust and reduced negative feedback. Additionally, studies investigate how user-generated reviews and ratings influence future booking decisions, with platforms like Yelp, Airbnb, and TripAdvisor demonstrating the critical role that reviews play in shaping consumer choices. However, some research points out potential biases in rating systems, such as recency bias or social influence, which may impact the fairness and accuracy of ratings.

III. System Overview

The system is built using a modular structure with the following key elements:

- Flask-based backend managing routing and logic
- SQLite database for persistent data storage
- HTML templates rendered using Jinja2 for clean user interfaces
- Review and chatbot logs stored as plain text
- Scikit-learn tools like Count Vectorizer and cosine similarity for chatbot classification
- Matplotlib and Seaborn for data visualization
- FPDF for PDF report generation

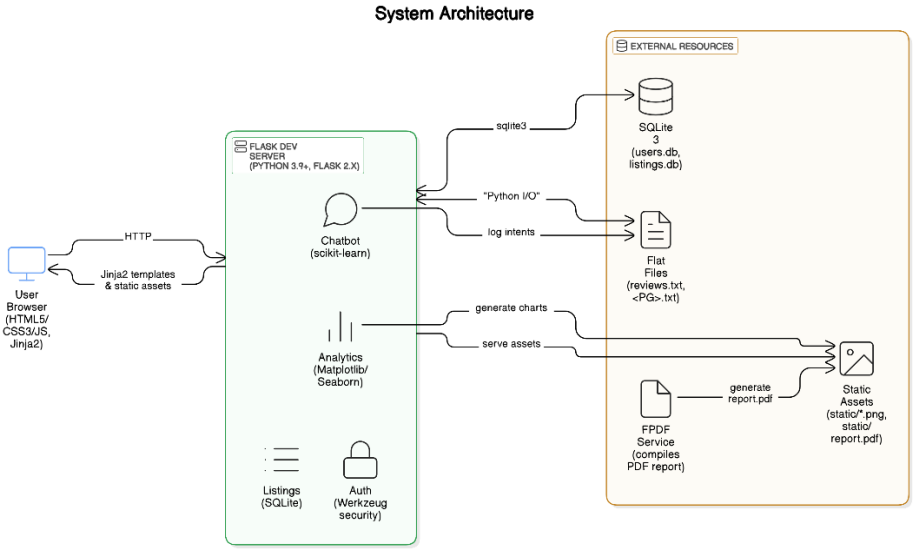

Fig. System Architecture

IV. Technologies Used

Python: Used for backend scripting, data handling, and implementing application logic.

Flask: A lightweight web framework for handling HTTP routes, user sessions, and rendering HTML pages.

SQLite: Embedded database for storing user data, listings, reviews, and service records.

Scikit-learn: Used for chatbot logic through Count Vectorizer and cosine similarity to match user intents.

Matplotlib & Seaborn: Visualization libraries for creating charts like bar, line, and pie graphs on the dashboard.

FPDF: Python library used to generate downloadable PDF reports of review data.

HTML/CSS with Jinja2: For building interactive, responsive web templates with dynamic content rendering.

Text Files: Used to store chatbot conversations and review logs for later processing and analysis.

V. Modules Implemented

- **Authentication & User Management**
  Manages registration, login, logout, and session tracking for three roles: Business, Student, and Admin. Implements secure password hashing, session validation, and role-based access control to ensure data privacy and secure access.

- **Business Module**
  Enables service providers to create, view, edit, and delete listings in four service categories: Accommodations, Gyms, Libraries, and Meal Services.
  Stores listing information (name, facilities, address, price, and image) in SQLite and provides a personalized dashboard for business users.

- **Student Module**
  Allows students to browse categorized listings, select desired services, and submit star-rated reviews with open-ended comments.
  Each review is logged with the listing name, review text, rating, and timestamp in a flat file for analysis.

- **Chatbot ("Urgent Care") Module**
  Provides rule-based conversational support for eight predefined issue categories (e.g., homesickness, academic pressure).
  Uses Count Vectorizer and cosine similarity to classify student queries and return predefined responses.
  Interactions are logged per listing.

- **Analytics & Reporting Module**
  Analyzes review and chatbot logs to compute metrics such as average ratings, sentiment types (positive, negative, neutral, sarcastic), and trending issues.
  Generates visual insights using bar, pie, and line charts via Matplotlib and Seaborn, and compiles a downloadable PDF report using FPDF.

- **Admin Module**
  Offers administrative controls to view/delete Student and Business accounts, manage service listings, and moderate reviews and chatbot logs.
  Maintains platform integrity and oversight through secure moderation tools.

- **Core Utilities**
  Provides shared helper functions for database handling, file I/O, sentiment and sarcasm detection, intent matching, and static asset management.
  Supports modular design and simplifies maintenance through reusable logic components.

VI. RESULTS

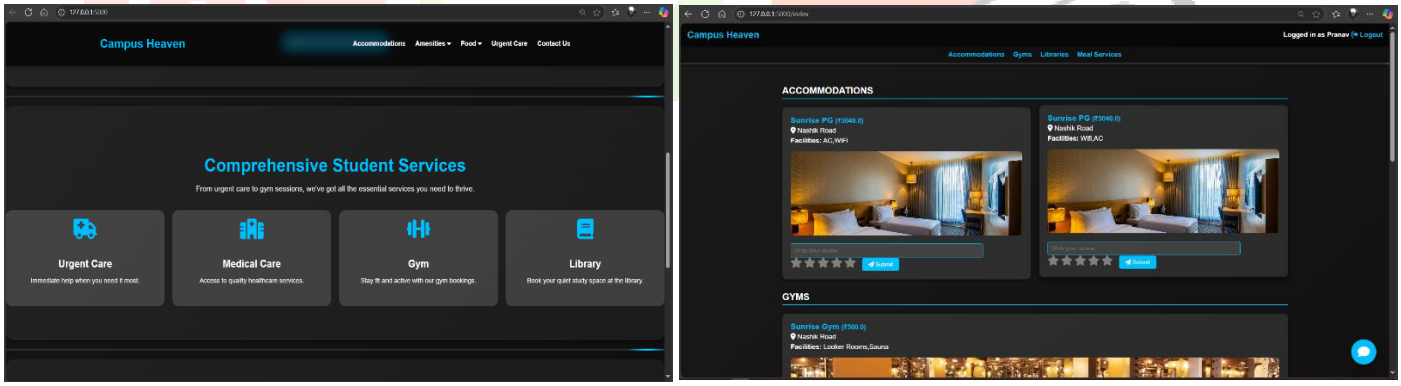

Figure 1: Home Page Displaying Student Services

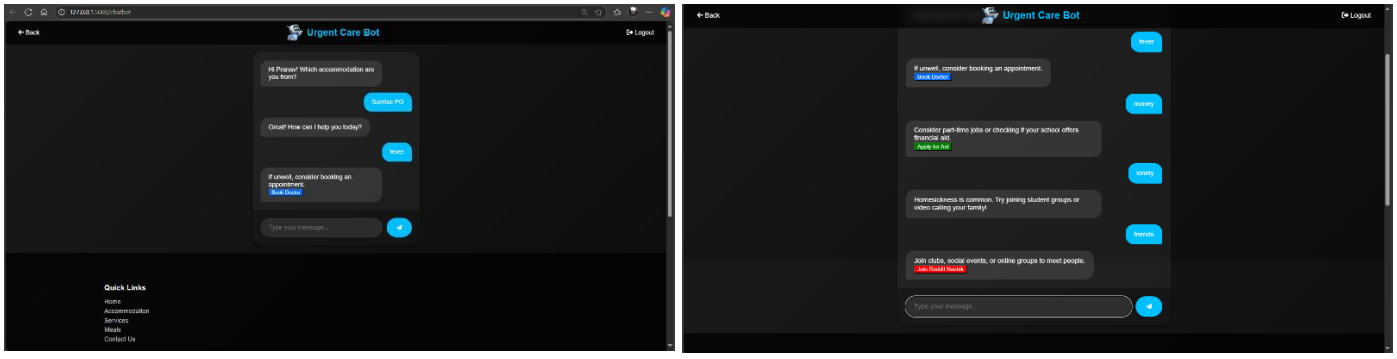

Figure 2: Chatbot Interaction in Urgent Care Module

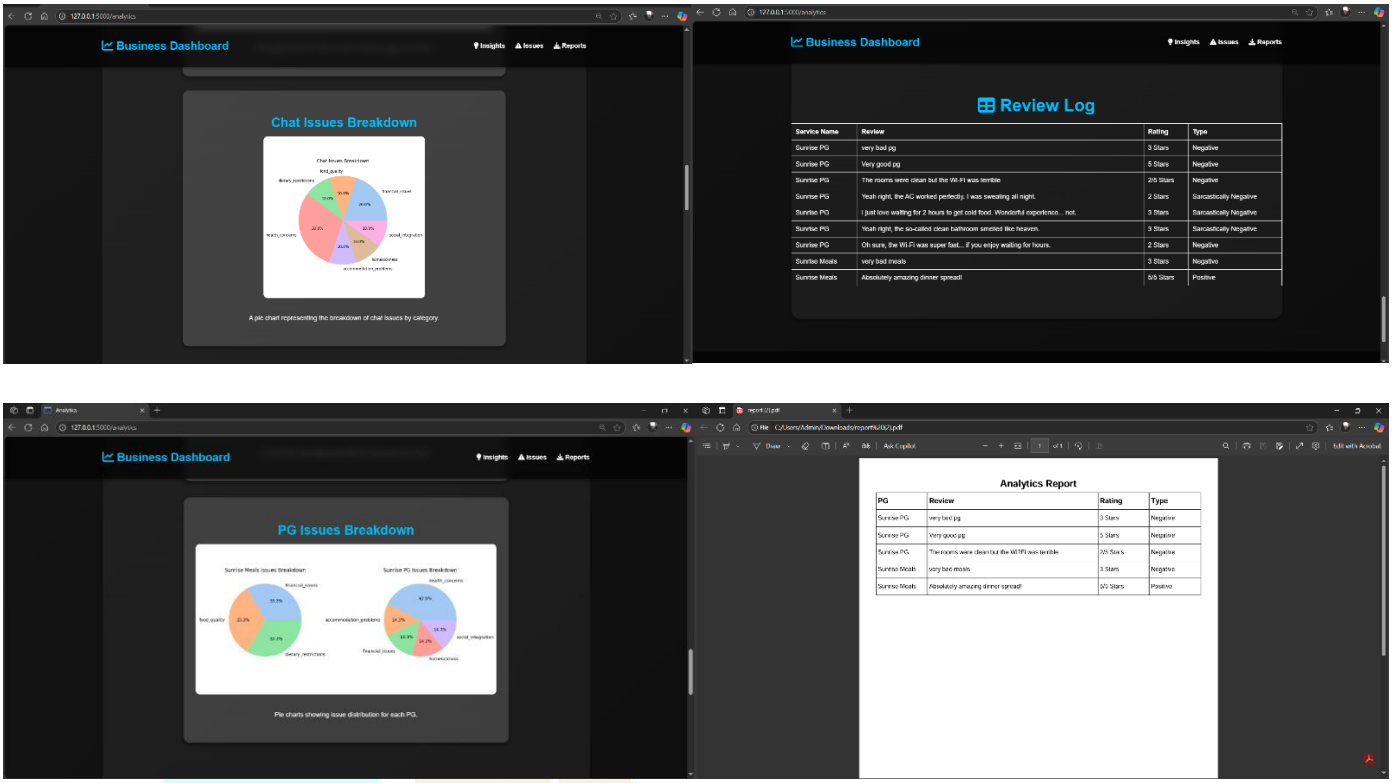

Figure 3: Visual Output/Report of Campus Heaven Platform

VII. Comparison Table

Feature	Phase 1 (Initial Version)	Phase 2 (Final Implementation)
User Registration & Login	✓	✓
Listing Form & Display	✓ (Accommodations Only)	✓ (All 4 service categories supported)
Review Submission	✓ (Raw text only)	✓ (With Sentiment and Sarcasm Detection)
AI Chatbot	–	✓ (Urgent Care Intent-Based Support)
Analytics Dashboard	–	✓ (With visual insights and category tracking)
PDF Report Generator	–	✓ (Downloadable review summary reports)

VIII. Conclusion

With the completion of Phase 2, Campus Heaven has evolved from a basic listing tool into a comprehensive AI-powered student support platform. It now enables students to browse services, express feedback, and get automated support, while providing administrators with the tools needed to interpret feedback and improve offerings. All enhancements align with the original vision and were implemented using core Python and open-source libraries.

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