AI Student SupportChatbot for myUMBC Portal

Deliverable #2 - Real world problem statement

Course: 636 Structured Systems Analysis and Design

Group 2: Pavithra (MI31417) , Sakshi (KN34693), Andrew (CO60011)

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Team Roles & Contributions

Pavithra

Backend + NLP Integration Lead

Led the development of the core chatbot engine, NLP model integration, and server-side logic.

Sakshi

UI/UX Design Lead

Led the design of the user interface, interaction flow, and developed high-fidelity prototypes.

Andrew

Documentation & Testing Lead

Led project documentation, presentation flow, user research, and comprehensive system testing.

Leadership Rotation Timeline

Pavithra (Early Phase) → Sakshi (Mid Phase) → Andrew (Final Phase)

Executive Summary

Project Goal & Scope

To build and integrate an AI-powered chatbot within the myUMBC portal, designed to provide fast, accurate, 24/7 support to students. This initiative aims to reduce support ticket volume, streamline student services, and enhance the overall student experience by providing a single, reliable point of contact for common inquiries.

Key Scope Areas

- Student Support
- Library Services
- Career Services
- Quick Campus Resources

Core Features

- Natural Language Query
- Knowledge Base Search
- Escalation Workflow
- Analytics Dashboard

Outcomes & Future

Major Outcomes & Challenges

Achieved: Functional prototype with core NLP and UI components.

Challenges: Data access limitations, scope refinement, and integration complexities.

Problems: Aligning requirements with technical feasibility and available data.

Future Roadmap

Enhanced NLP: Improve intent recognition and contextual understanding.

Secure API Integration: Connect with live campus systems for real-time data.

Mobile-First Design: Optimize for mobile app integration and accessibility.

Project Description

The Problem Statement & Opportunity

Students face fragmented and scattered support systems , leading to frustration and repetitive inquiries that burden staff, spam of emails and doubts regarding basic campus resources - across various departments.

This project seizes the opportunity to provide a single, reliable, and intelligent point of contact, offering fast, accurate, 24/7 answers to improve student satisfaction, easy access to campus resources and operational efficiency.

Key Stakeholders

- Students & Staff (enrolled or have myUMBC Login)
- Career Center & Handshake
- IT Help Desk
- ISSS
- Library Services
- myUMBC Portal Team

System Request & Feasibility Analysis

Technical Feasibility

Viable through secure NLP/LLM model hosting, integrated knowledge base, and API connectivity within the UMBC ecosystem.

Economic Feasibility

No extra-cost prototype with significant long-term cost savings potential via reduced support ticket load and increased staff and resources efficiency.

Organizational Feasibility

Strong alignment with UMBC’s strategic goals for efficiency and student experience, with staff support for escalation workflows.

Management & Planning Evolution

Development Model: Agile/Iterative

Pros: Allowed for flexibility, continuous feedback, and adaptation to changing requirements.

Cons: Required high-end tech team led to some scope adjustments mid-semester.

Communication Plan

Weekly meetings, Google Chat for instant communication, and clear email threads for task division.

Outcome: We experienced no communication issues.

After the Mid-Term review, we changed the plan of individual training the data-set to using NLP, LLM and Hugging Face. Milestones were adjusted from the initial plan to a revised plan to better accommodate technical discoveries and integration challenges.

Requirements Elicitation & Summary

Elicitation Methods

- Internal brainstorming sessions
- Reference analysis of UMBC support portals
- Review of sample documents for incoming students.

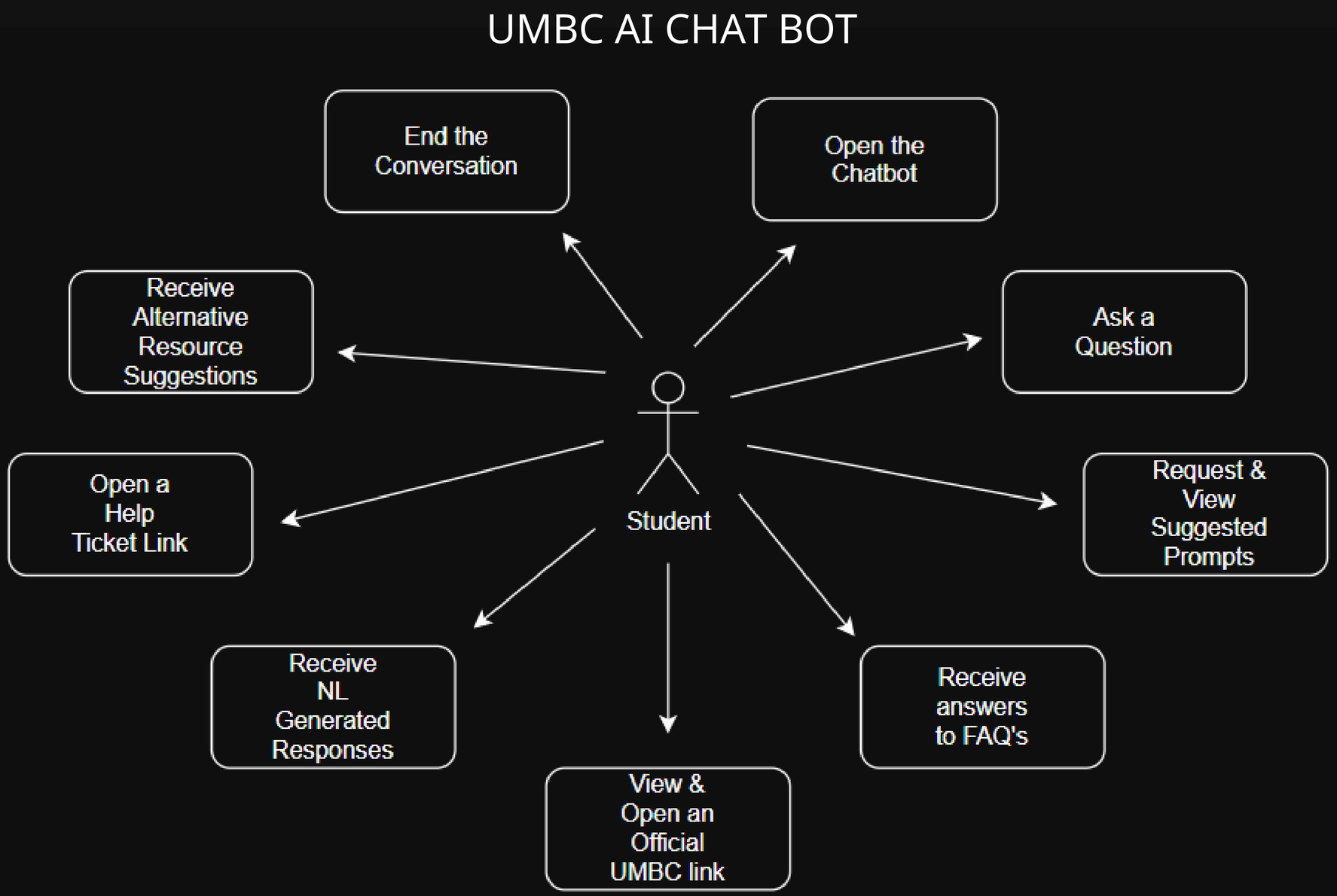
Functional Requirements

- The system will have an intuitive chatbot interface
- The system will perform knowledge-base search & retrieval
- The system will perform automated escalation workflow
- The system will provide ease of access to frequently used external portals linked with UMBC (Handshake, ISSS, Transit)

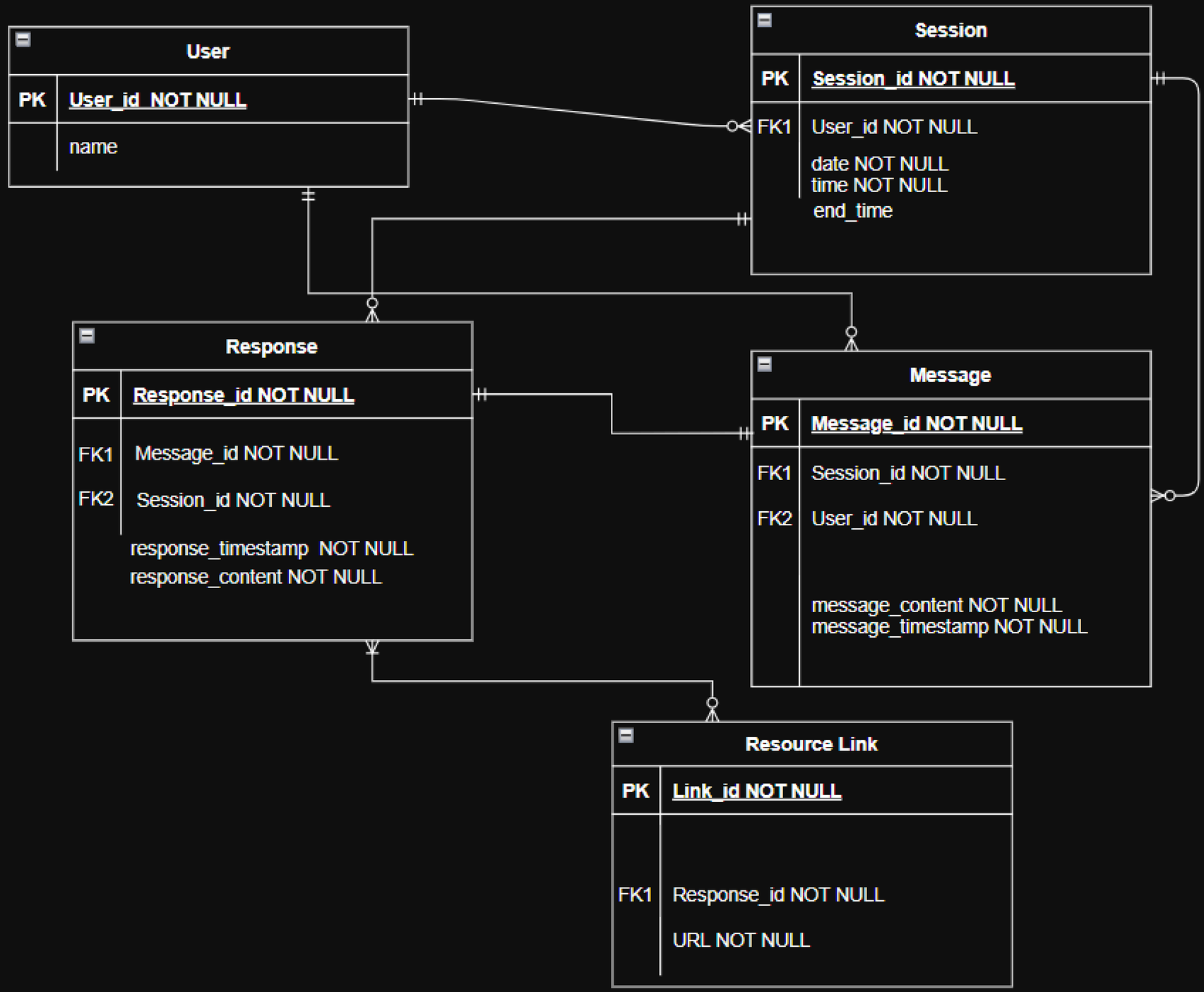
Non-Functional Requirements

- Response time: **3-5 seconds**
- Concurrent users: **1 per computer as of now it’s based on code** (In the future >15k users will be able to access at a time.)
- FAQ accuracy: **95%**
- Desktop compatibility
- Accessibility (WCAG 2.1 AA) compliance
- No Personally Identifiable Information collection or retention

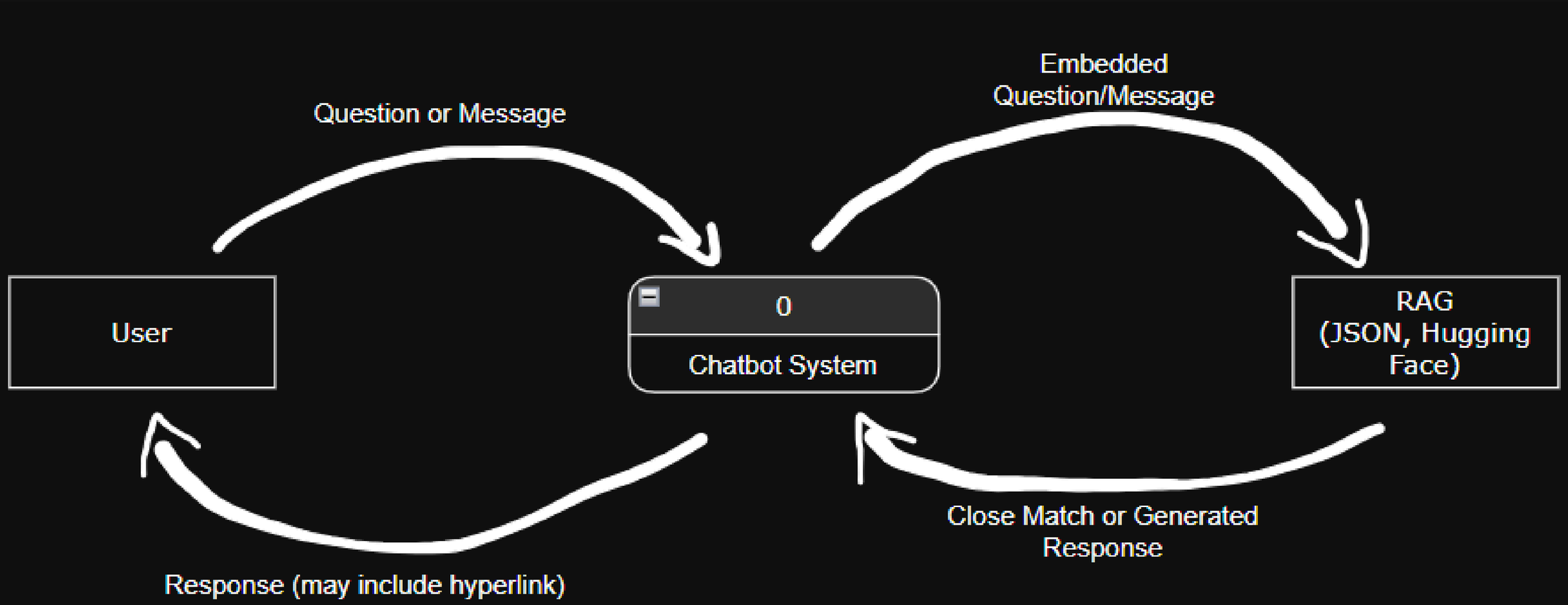
Use Case Diagram



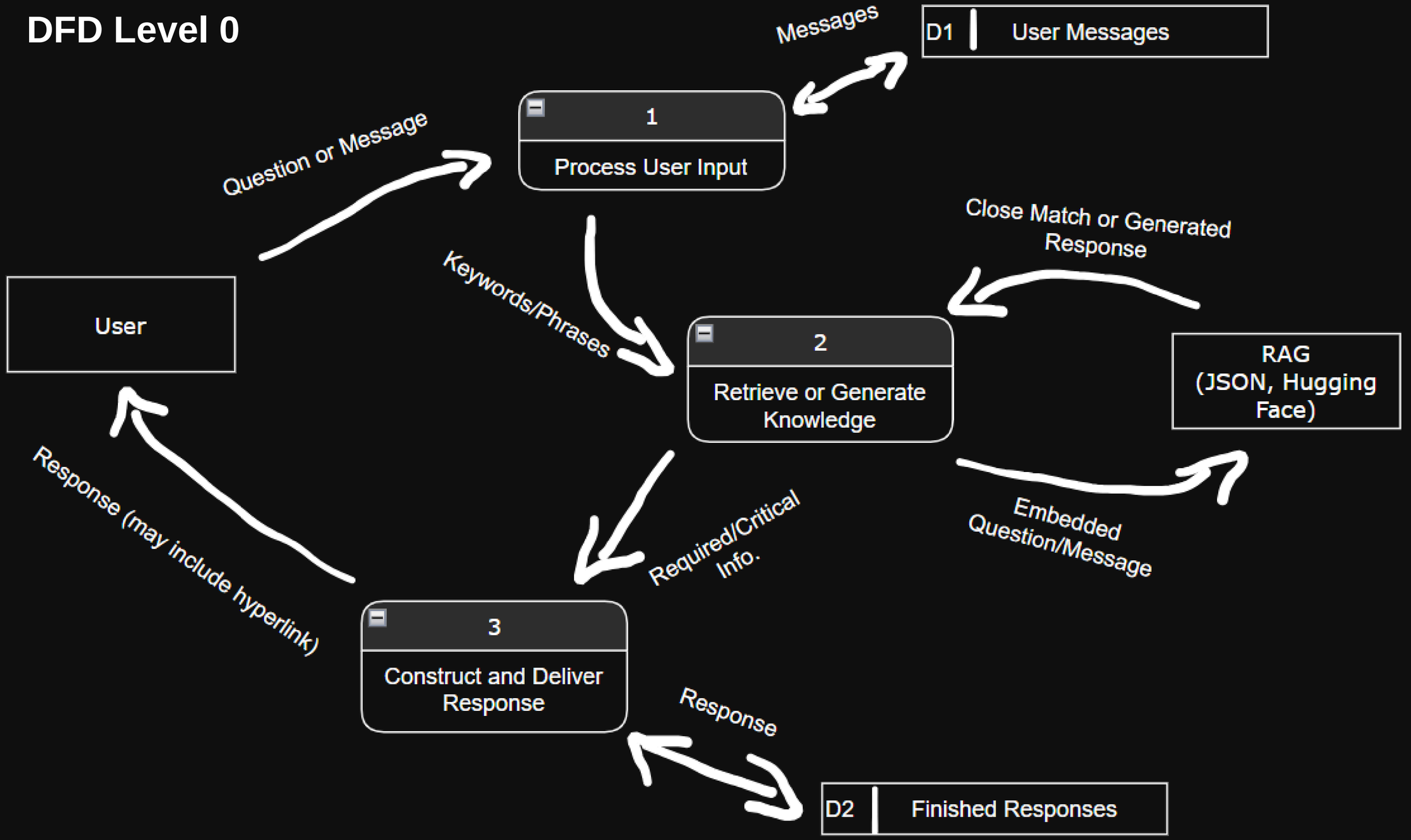
Entity-Relationship Diagram



DFD Context-Level

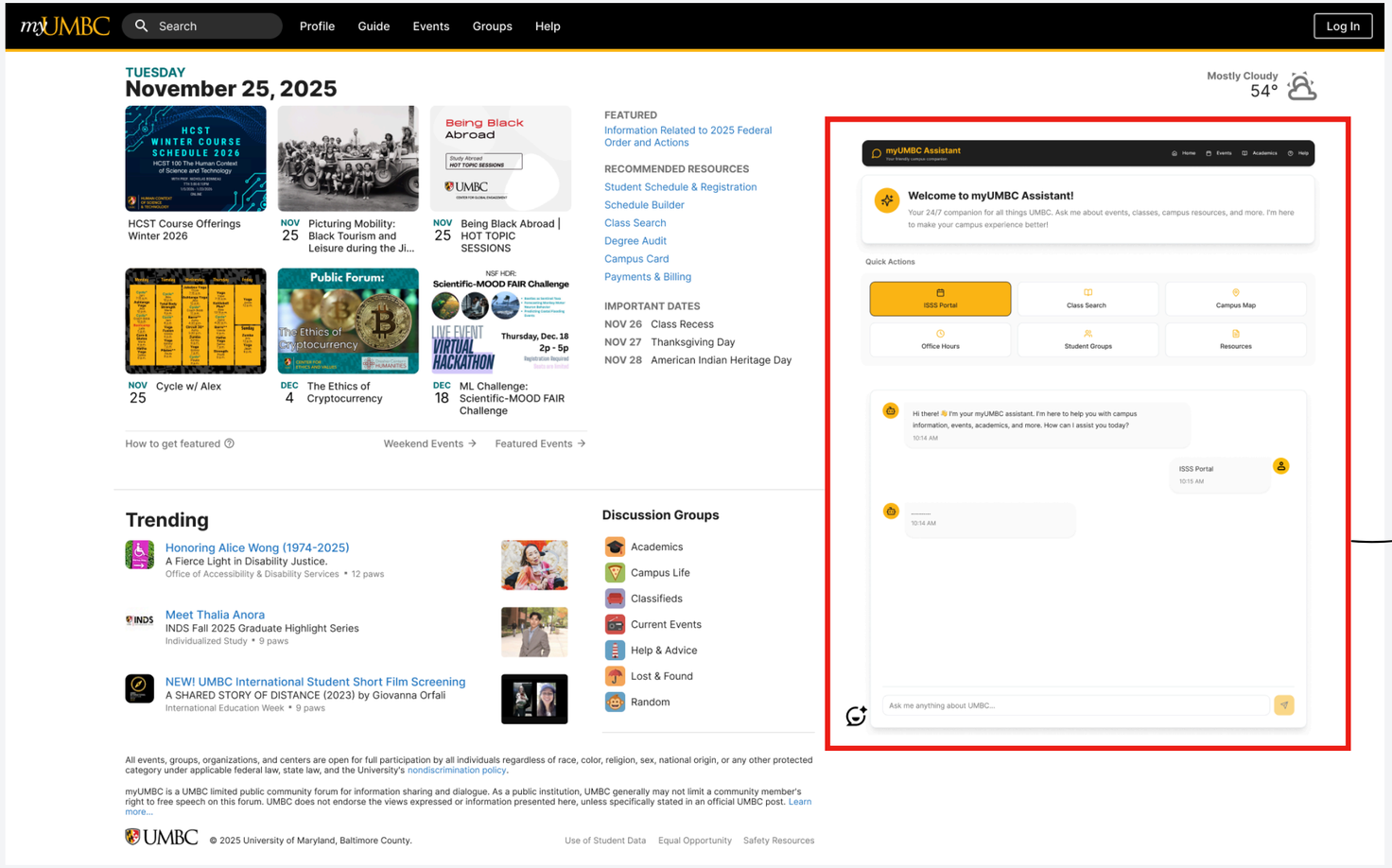


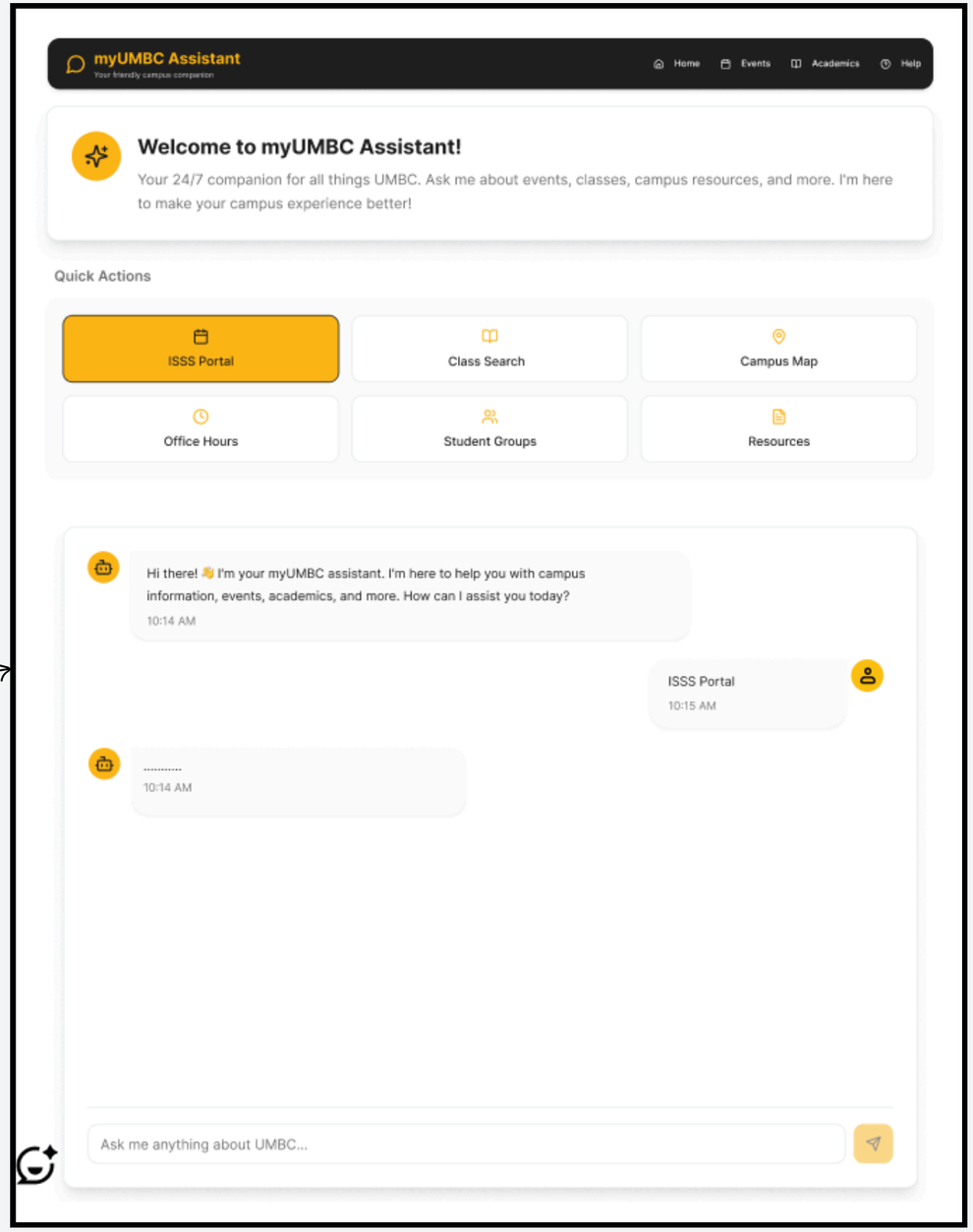
DFD Level 0


Messages
D1
User Messages
1
Process User Input
Question or Message
User
Keywords/Phrases
Close Match or Generated Response
2
Retrieve or Generate Knowledge
RAG (JSON, Hugging Face)
Response (may include hyperlink)
Required/Critical Info.
Embedded Question/Message
3
Construct and Deliver Response
Response
D2
Finished Responses

User Interface & Mockup

UI Mockup Screenshot





System Design & Future Roadmap

Acquisition Strategy

A custom build leveraging modular components and integrating with existing campus APIs and authentication systems.

UI Design Summary

A clean, UMBC-branded interface featuring a central chat window, quick action links, and clear fallback options for escalation.

Limitations & Assumptions

Prototype-level NLP, limited training dataset, and assumed access only staff or students who have myUMBC.

Future Work

- Full API integration with live campus systems.
- Advanced analytics and user behavior insights.
- Improved chatbot personalization and learning.
- Dedicated mobile app integration and optimization.

Code Structure & Key Modules

Frontend

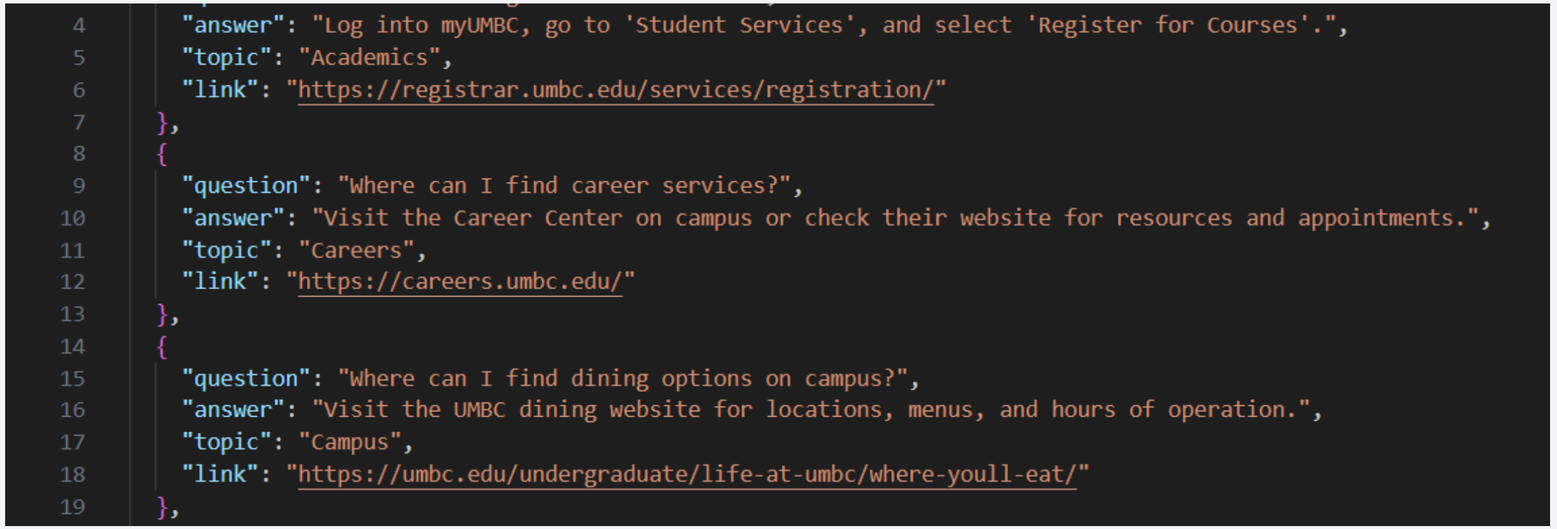
Handles user interaction, chat interface, and presentation logic.

Backend

Manages server-side logic, request routing, and model communication.

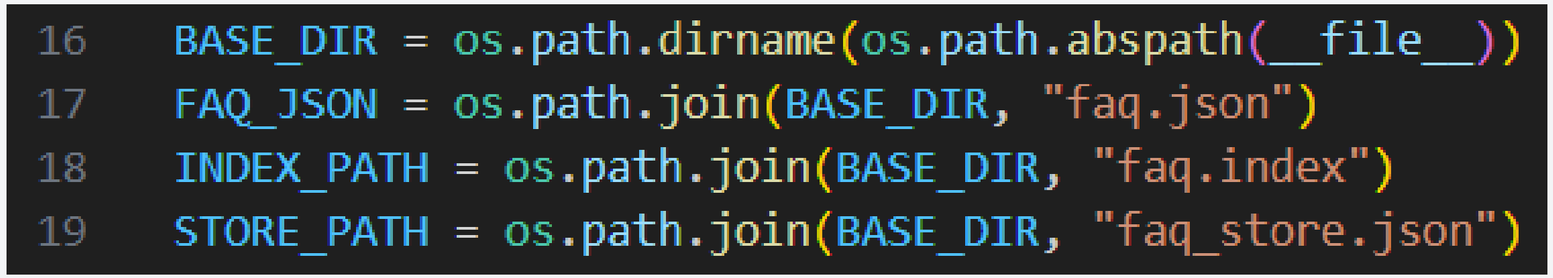
API Connectors

Manages communication with external campus systems and services.



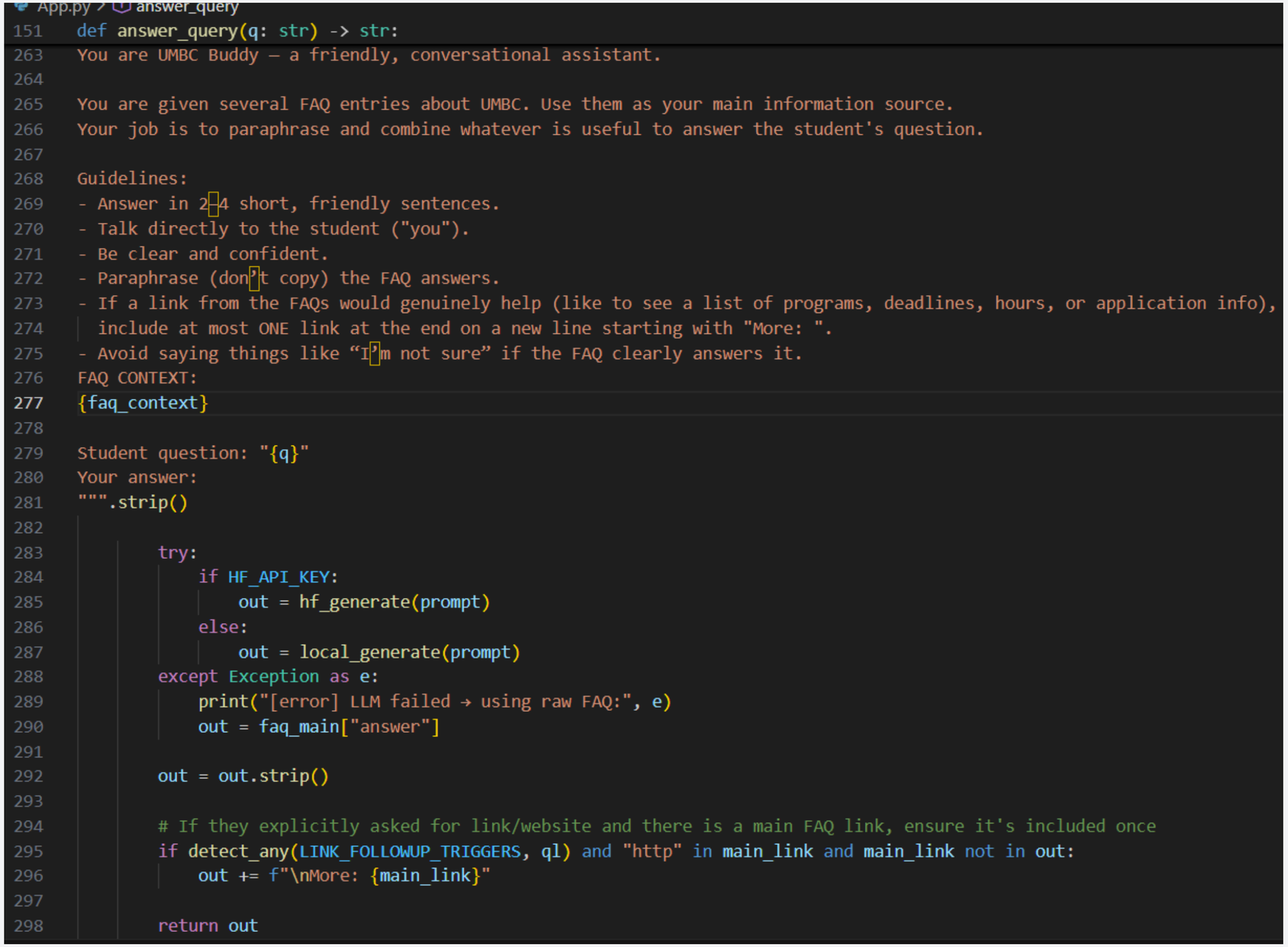
```
    "answer": "Log into myUMBC, go to 'Student Services', and select 'Register for Courses'.",
    "topic": "Academics",
    "link": "https://registrar.umbc.edu/services/registration/"
  },
  {
    "question": "Where can I find career services?",
    "answer": "Visit the Career Center on campus or check their website for resources and appointments.",
    "topic": "Careers",
    "link": "https://careers.umbc.edu/"
  },
  {
    "question": "Where can I find dining options on campus?",
    "answer": "Visit the UMBC dining website for locations, menus, and hours of operation.",
    "topic": "Campus",
    "link": "https://umbc.edu/undergraduate/life-at-umbc/where-youll-eat/"
  },
```

1. Image: FAQ UMBC data



```
BASE_DIR = os.path.dirname(os.path.abspath(__file__))
FAQ_JSON = os.path.join(BASE_DIR, "faq.json")
INDEX_PATH = os.path.join(BASE_DIR, "faq.index")
STORE_PATH = os.path.join(BASE_DIR, "faq_store.json")
```

2. Image: FAQ Vector creation



3. Image: Chatbot Model

Our chatbot uses a Retrieval-Augmented Generation (RAG) approach, where a sentence-transformer model retrieves the closest FAQ using vector embeddings, and the Microsoft Phi-3 Mini Instruct LLM generates a fallback response when no close match is found.

Conclusion & Expected Impact

Key Contributions

A functional prototype demonstrating a viable, user-friendly AI chatbot tailored for the myUMBC portal.

Expected Impact

Significant improvement in student experience through instant support and measurable organizational benefits via reduced staff load, spam emails for regular questions, also helping out students to find a go-to AI source related to UMBC.

Team Reflections & Next Steps

The project successfully met its core objectives, though it is limited by its prototype nature. Key lessons include the importance of early data access and iterative testing.

Next Steps: Move towards production deployment, expand personalization, and conduct a pilot study with real student users.

We used AI for 1 tasks:

ChatGPT helped us in organizing/building the JSON files. We gave it the information to put into those files, and the AI organized them into a polished version. There were 500+ JSON data entries, so doing all of them would be tedious.

Thank You!