NYU SCHOOL OF PROFESSIONAL STUDIES

Project Charter

Syllabi Chat: an LLM Chatbot to Query a Database of Syllabus using RAG

Project Manager: Zhihang Zhu

Sponsor: Dr. Andres Fortino

Prepared by: 09/19/2024

Name and Location of Client Organization: The Digital Forge, NYU School of Professional Studies. At 12 West 43rd Street, NY, NY.

Project Goal:

Develop a chatbot for students and faculties to query course syllabi with high efficiency and accuracy.

Problem/Opportunity Definition:

a) How can a chatbot using Retrieval-Augmented Generation (RAG) techniques effectively query a large database of course syllabi to provide more accurate and comprehensive responses compared to current systems?

b) To what extent can the integration of RAG techniques with LLMs improve the efficiency and relevance of responses to queries about course information from a large syllabi database?

c) What is the potential impact of an AI-driven chatbot using RAG on the accessibility and understanding of course information for faculty and students in higher education settings?

Project Description:

The purpose of this project is to create a chatbot that effectively queries a large database of course syllabi using RAG techniques. Recent advancements in LLMs and information retrieval methods have opened new possibilities for document querying, allowing for more precise and contextually relevant responses. This project seeks to explore these possibilities by developing a prototype chatbot that can overcome the limitations of the current system and provide enhanced access to course information.

To begin, the project will involve collecting and preprocessing syllabi data from the Management and Technology programs (MSPM and MASY) over the past five years. This comprehensive dataset will form the basis for augmenting the LLM's knowledge base using the RAG approach. The chatbot will be designed to receive and interpret user queries, providing relevant information from the syllabi database.

The chatbot's development will include the creation of prompts that enable the LLM to generate accurate and useful responses. A user-friendly interface will be developed to facilitate easy interaction for both faculty and students. The effectiveness of this chatbot will be tested through a limited technology trial, comparing its responses to those generated by traditional search methods. This evaluation will focus on factors such as response relevance, accuracy, and comprehensiveness.

Finally, the project will produce a comprehensive report documenting the development process and the results of the technology trial. This report will include initial findings and discuss the potential implications of using AI-assisted information retrieval in educational settings. Additionally, a draft for a technical conference paper will be prepared, outlining the project's approach, key findings, and the broader impact on improving access to and understanding of course information.

Project Sponsor:

The principal project sponsor for this project will be Dr. Andres Fortino, Clinical Associate Professor, NYU (https://www.linkedin.com/in/afortino). The role would be the Client of this project.

Project Objectives:

Objective #1: Design a user-friendly chatbot for course syllabi query tasks within the next 3 months (September 10, 2024 – December 5, 2024).

Measurement: Do related research and write a comprehensive literature review about LLMs and RAG. All the needed files would be stored in GitHub repository and all the add, delete, merge, pull, and modify operations would be recorded. At the final stage, combine the back-end system with the front-end query page.

Objective #2: Build up the user-friendly GUI for students and faculties after the background algorithms are developed (Expected in November, 2024).

Measurement: Delivery in HTML5 based web application by end of the semester. It would be better to have a server to support the website going live while this chatbot would mainly be based on web pages.

Objective #3: Develop efficient query algorithms using RAG and LLMs in the first two months (September 10, 2024 – November 14, 2024).

Measurement: Design embedded query algorithms for that syllabus. The detailed algorithms and their working principles would be delivered through the user manual by the end of the semester.

Objective #4: Use data sets specified by the client to test the validity of the algorithm.

Measurement: The verification of this chatbot system would be delivered by the end of this semester. Also, the detailed methodology will be included in the final presentation.

Project Scope

In-Scope Activities:

- **Development of the Chatbot:** Implement a chatbot using Retrieval-Augmented Generation (RAG) techniques to query a large syllabi database.
- **Algorithm Design:** Develop and embed efficient query algorithms that integrate RAG and large language models (LLMs) to ensure accurate and relevant responses.
- **GUI Development:** Create a user-friendly interface for faculty and students to interact with the chatbot.
- **Technology Trial and Evaluation:** Conduct a limited technology trial comparing chatbot responses to traditional search methods, evaluating response accuracy and comprehensiveness.
- **Documentation:** Produce a comprehensive report and a draft for a technical conference paper to summarize the findings and implications of the project.

Out of scope activities:

- **Data Collection and Preprocessing:** These data are prepared and already stored in the related repository, and the project will mainly be based on these data. There is no need to collect other syllabus**.**
- **General Curriculum Development:** Creating or updating the course syllabi themselves is outside the project's scope. This project will only be responsible for integrating this information and provide querying methods.
- **Post-Implementation Support:** Long-term maintenance, updates, or support for the chatbot after the project concludes are beyond the scope.

Risks and Mitigation Strategies

- **Risk 1:** Challenges with RAG and LLM Algorithm Implementation
  Mitigation Strategy: Conduct thorough research about RAG and LLM and develop prototype algorithms early in the project timeline to identify technical challenges. Implement regular code reviews and testing to ensure the algorithms work as intended. Have a backup plan of simpler search algorithms in case RAG or LLM integration faces delays.
- **Risk 2:** Potential Data Incompleteness or Inaccuracy
  Mitigation Strategy: Collaborate closely with stakeholders like students and related faculties to ensure that the syllabi data is correctly collected and verified. Develop a data validation process during the preprocessing phase to identify and address missing or incorrect data early (If time allows). If the immediate modification cannot be implemented, minor mistakes in the given information would be acceptable and obvious errors will be corrected promptly.
- **Risk 3:** Possible Delay in Project Development timeline
  Mitigation Strategy: Set up buffer time into the project schedule, particularly for high-risk project procedures like algorithm design and final software testing. Prioritize critical tasks and ensure that key deliverables like the chatbot and its algorithms are developed first to ensure on-time delivery of core functionalities.

Communication Plan

The communication method would be virtual meeting hold on Zoom, and the frequency would be around 2 weeks. Each meeting will include a summary report on the progress of the previous project phase, along with a rough plan for the next phase (before the next meeting). During the meeting, issues encountered in the current phase will be

discussed, and feasible solutions will be identified. If any compromises are needed, they will be negotiated during the meeting.

Schedule Overview

Project Start Date: September 12, 2024

Estimated Project Completion Date: December 5, 2024

Major Milestones

1. Finish the Literature Review and Research about RAG and LLMs.
2. Pre-process the given syllabi and transform the information into other kinds of format such as CSV or JSON.
3. Implement the Prototype of Query Algorithms Using RAG.
4. GUI development and backend system integration.
5. Completion of Technology Trial and User Feedback Collection.
6. Final Report, Project Presentation and Project Closure.

External Milestones Affecting the Project, if any

No external milestones

Impact of Late Delivery

1. The chatbot is intended to serve faculty and students, particularly during course registration periods, syllabus review, and other time-sensitive academic tasks. A delayed delivery may miss critical academic deadlines, such as the start of the next semester, when students and faculty are most likely to need easy access to course syllabi.

2. Sponsors and other key stakeholders may lose confidence in the project team's ability to deliver. This could affect future collaboration or funding opportunities for similar projects.
3. If the project is delayed, there may be insufficient time to conduct proper testing and gather feedback from end users (faculty and students). This could result in a less refined and effective system.

I am signing below to assert that I have created this original project charter and have reviewed this document with my sponsor.

Student Signature: Zhilong Zhu

I am signing below to assert that I have reviewed this project charter with the student, and we are aligned on high level deliverables of this project. Detailed requirements may be created or revised through the duration of the project.

Sponsor Signature: Andres Fortino