COMP5423 Natural Language Processing Group Project

Chat with Data: A Question-answering System for Data Analysis

In this project, let us develop a data analysis-oriented question-answering system based on large language models (LLMs). This system will assist users in analysing data by engaging in natural language conversations, allowing them to ask questions and obtain relevant insights from the data.

The system could consist of various tasks, such as crawling online data from social media, e-commerce platforms, or other websites, retrieving relevant data based on user queries, and providing analytical answers by chatting with the retrieved data. For example, a user could ask, "How many people like product X?", and the system would analyse the data to provide an accurate answer. There are no restrictions on the data domain; students are encouraged to choose any domain they are familiar with.

To successfully complete the project, each group will go through the following key steps, using the knowledge and techniques learned in class and beyond:

- **Data preparation:** Crawl data from social media, e-commerce platforms, or other online sources. Preprocess and clean the collected data to ensure data quality.
- **Algorithm design:** Explore advanced natural language processing (NLP) approaches to building question answering systems. Select appropriate lexical or embedding-based information retrieval models to allow the system to retrieve relevant data based on user queries. Design effective prompting strategies for large language models to analyse retrieved data and generate accurate responses.
- **System implementation:** Implement the question-answering system using frameworks and libraries such as PyTorch and Hugging Face. Develop an interactive and user-friendly interface that allows users to easily engage in natural language conversations with the system.
- **Performance evaluation:** Evaluate the performance and effectiveness of the developed question-answering system. Carry out thorough evaluations using appropriate data sets, metrics or simulated user interactions. Compare the system's performance against ground truth or established benchmarks. Analyse and interpret the evaluation results, identifying the strengths and weaknesses of the system and suggesting improvements.

Important Dates.

There are two important demonstrations that students need to prepare:

1. **In-Class Presentation with a Live Demonstration (18:30 to 21:20 November 20, 2024)**: Each group will give a 15-minute presentation during the November 20, 2024 class. The presentation should showcase the task settings, challenges, methodologies, and their developed question-answering systems' functionality, features, and effectiveness. During the presentation, students will conduct a live demonstration, showcasing the system's capability to analyze data through interactive chatting.
2. **Project Report Submission (by 23:59 on November 26, 2024, Tuesday)**: Alongside the class presentation, each group should submit a comprehensive

project report. The report should document the task setting, background, system development process, challenges, methodologies, outcomes, and evaluation results, together with the contributions made by each group member. The report should be **capped at 8 A4 portrait** pages with unlimited spaces for references in APA formatting. There is no need to include a Table of Contents and the cover page. The text should be *formatted in 12-size Times New Roman, 1.0 line space, and a single column with a 1-inch margin,* while there are no requirements for figures and tables (students are encouraged to put in figures and tables to make the writing more eye-catching and easy to understand).

Assessment Rubrics.

The project will take 25% of the final grade with the assessment rubrics as follows. The rubric assesses the project based on the given criteria, with a scale of 5% to 1%, where 5% represents the highest level of achievement and 1% represents the lowest. The descriptions provided in the rubric can be tailored to the project's specific requirements.

1. **Appropriateness (5%)**:
   - Task settings, challenges, methodologies, and system functionality are highly appropriate and relevant. (5%)
   - Task settings, challenges, methodologies, and system functionality are mostly appropriate and relevant. (4%)
   - Task settings, challenges, methodologies, and system functionality demonstrate some level of appropriateness. (3%)
   - Task settings, challenges, methodologies, and system functionality are inadequate. (2%)
   - Task settings, challenges, methodologies, and system functionality are inappropriate. (1%)
2. **Soundness (5%):**
   - The project demonstrates a comprehensive and well-organized development process with clear and logical explanations. (5%)
   - The project demonstrates a mostly comprehensive and well-organized development process with mostly clear and logical explanations. (4%)
   - The project demonstrates some level of organization and logic in the development process, but with some unclear explanations. (3%)
   - The project demonstrates limited organization and logic in the development process and provides inadequate explanations. (2%)
   - The project is disorganized and lacks a clear or logical development process with unclear or illogical explanations. (1%)
3. **Excitement (5%):**
   - The project presents innovative and engaging ideas that consistently capture the attention of the audience. (5%)
   - The project presents engaging ideas that mostly capture the attention of the audience, but may lack consistency. (4%)
   - The project presents some level of engagement, but with areas of improvement and inconsistent audience attention. (3%)
   - The project lacks innovation and fails to capture the audience's excitement consistently. (2%)
   - The project lacks excitement or fails to engage the audience. (1%)

4. **Presentation (5%):**
    - The presentation is highly polished and professional, with excellent delivery and effective use of visual aids. (5%)
    - The presentation is mostly polished and professional, with good delivery and adequate use of visual aids. (4%)
    - The presentation has some areas of improvement in polish and professionalism, and delivery may lack consistency. (3%)
    - The presentation lacks polish and professionalism, and delivery is weak. Visual aids are ineffective. (2%)
    - The presentation is poorly executed, making it difficult to follow, with ineffective use of visual aids. (1%)
5. **Writing (5%):**
    - The project report is well-written, with clear and concise explanations of ideas and proper use of grammar and formatting. (5%)
    - The project report is mostly well-written, with mostly clear and concise explanations of ideas and mostly proper use of grammar and formatting. (4%)
    - The project report is adequately written, with some clarity issues and inconsistent use of grammar and formatting. (3%)
    - The project report is poorly written, with unclear or confusing explanations and significant errors in grammar and formatting. (2%)
    - The project report is very poorly written, with numerous clarity and formatting errors, making it difficult to understand. (1%)