  
**Interactive Chat Application for Conversations with PDF or Document Content Using a Language Model (LLM)**

**Assignment Documentation**

**BMCS2123**

**NATURAL LANGUAGE PROCESSING**

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# **Introduction**

## 1.1 Problem Background

The Interactive Chat Application for Conversations with PDF or Document Content Using a Language Model (LLM) addresses the challenge of efficiently extracting and comprehending information from dense and complex document formats, particularly PDFs. Traditional methods of interacting with PDFs, such as direct downloading and static reading, often require external references for clarity or understanding, which can be time-consuming and inefficient. The rapid advancement in Natural Language Processing (NLP) and the development of sophisticated Language Models (LLMs) have created opportunities to revolutionize how people interact with textual content.

The problem statement is rooted in the need for a more dynamic and user-centric approach to document interaction. This involves developing an interactive chat application that leverages the capabilities of an LLM to provide real-time text extraction, summarization, translation, and user-defined question-answering. The aim is to streamline document interaction, making information retrieval efficient and user-friendly.

The proposed project seeks to address the limitations of current document interaction methods by creating an interactive PDF chat program with features such as text extraction, text translation, user-defined prompt question answering, and document viewing. This application is designed to enhance user interaction with documents, providing instant clarifications or explanations for any issue encountered within the text, thus speeding up the learning or understanding process.

Most of the ideas presented in this project are creative and aim to improve learning opportunities by obtaining document summaries, supporting multilingual responses for improved accessibility, and including a document preview section with features such as zoom, rotation, and download. Although the current model faces limitations in handling image-rich PDFs, future enhancements include better image rendering, conversation history, and query download features.

In summary, the background of this problem highlights the necessity for an innovative approach to document interaction, utilizing the power of LLMs to transform static reading into interactive and efficient information retrieval.

## 1.2 Objectives/Aims

The objectives of the Interactive Chat Application for Conversations with PDF or Document Content Using a Language Model (LLM) are designed to enhance user interaction with documents through advanced natural language processing capabilities. The objectives are as follows:

1. To enhance the chatbot's conversational quality and response accuracy, ensuring users receive the most relevant information from documents. This objective aims to improve the interaction between users and documents by leveraging the capabilities of LLMs to provide real-time text extraction, summarization, translation, and user-defined question-answering.
2. To increase the accessibility and comprehension of document content by implementing multilingual support. This objective seeks to improve the accessibility of document content to a global user base by delivering information in a language of the user's choice, thereby enhancing understanding and usability.
3. To develop a user-friendly document preview section with features such as zoom, rotation, and download capabilities. This objective aims to provide users with a comprehensive document interaction experience by offering a preview of the uploaded document, along with additional features to manipulate and access the document content.

These objectives are designed to address the existing problems in document interaction by creating an interactive chat application that utilizes the strengths of LLMs to transform static reading into an interactive and efficient information retrieval process. Most of the ideas presented in this project are creative and aim to improve learning opportunities and streamline document interaction, making information retrieval efficient and user-friendly.

## 1.3 Motivation

The development of an Interactive Chat Application for Conversations with PDF or Document Content Using a Language Model (LLM) holds significant potential for both commercialization value and social impacts.

Commercialization Value:

1. Enhanced Efficiency in Information Retrieval: The application streamlines document interaction, making information retrieval efficient and user-friendly. This efficiency can be particularly valuable in corporate environments where quick access to information can lead to faster decision-making and operational efficiency.
2. Multilingual Support and Global Accessibility: By offering real-time text extraction, summarization, translation, and user-defined question-answering in multiple languages, the application increases its market potential globally. Businesses with international operations can leverage this feature for cross-cultural communication and document understanding.
3. Education and Learning Opportunities: The application can be integrated into educational platforms to assist students and researchers in understanding complex documents, thus enhancing learning opportunities. This can lead to partnerships with educational institutions and e-learning platforms.

Social Impacts:

1. Improved Accessibility and Inclusivity: Large language models like those utilized in this application can improve accessibility in collective processes by offering translation services and writing assistance, breaking down barriers and enabling broader participation in discussions.
2. Enhancing Collective Intelligence: By sharing information, summarizing perspectives, and facilitating consensus among diverse viewpoints, LLMs can aid in forming opinions and supporting collective decision-making. This can lead to more informed and democratic decision processes at various levels of society.
3. Potential Risks and Mitigation: While there are benefits, there are also risks associated with the widespread use of LLMs, such as undermining the diversity of the information landscape and creating false consensus. To mitigate these risks, it is recommended that developers disclose the sources of training data, implement external audits, and prioritize diversity in development and training processes.
4. Supporting Collective Intelligence: Ensuring LLMs support collective intelligence requires transparency in their development and the implementation of monitoring mechanisms. This can lead to more responsible and ethical use of technology in society.

In summary, the Interactive Chat Application has the potential to revolutionize how individuals and organizations interact with documents, offering commercial opportunities and significant social benefits. However, it is crucial to address the associated risks to ensure that these technologies are used responsibly and ethically.

## 1.4 Timeline/Milestone

To effectively manage the development of the Interactive Chat Application for Conversations with PDF or Document Content Using a Language Model (LLM), a detailed timeline with specific milestones is essential. Below is a proposed schedule for the project, presented in a tabular format for clarity:

|  |  |  |
| --- | --- | --- |
| **Phase** | **Start Date** | **End Date** |
| Planning & Research | 18/11/2024 | 22/11/2024 |
| Prototype Design | 23/11/2024 | 24/11/2024 |
| Development – Model Selection & Environment Setup | 25/11/2024 | 27/11/2024 |
| Development – Text Extraction | 28/11/2024 | 30/11/2024 |
| Development – LLM Integration | 1/12/2024 | 4/12/2024 |
| Development – User Interface & Chat | 5/12/21024 | 10/12/2024 |
| Testing & Refinement | 11/12/2024 | 19/12/2024 |
| Documentation & Deployment | 20/12/2024 | 22/12/2024 |

# **Research Background**

## 2.1 Background of the applications

*Provide detailed explanations of the background of the application, e.g. machine learning algorithms, chatbot development, recommender system, sentiment analytic applications, robotic processing automation applications, image processing applications, etc.*

>

## 2.2 Analysis of selected tool/algorithm with any other relevant tools/algorithms

*Fill the table below and change the tools’ names. You may add more columns.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tools comparison** | **Remark** | **Selected tool/algorithm’s name**  **Adobe Acrobat Pro** | **Other tool/algorithm’s name**  **fdgkdsk** | **Other tool/algorithm’s name**  **jhgfjgh** |
| Type of license and open source license | State all types of license |  |  |  |
| Year founded | When is this tool being introduced? |  |  |  |
| Founding company | Owner |  |  |  |
| License Pricing | Compare the prices if the license is used for development and business/commercialization |  |  |  |
| Supported features | What features does it offer? |  |  |  |
| Common applications | In what areas is this tool usually used? |  |  |  |
| Advantages | Pros |  |  |  |
| Limitations | The drawbacks of the software |  |  |  |

## 2.3 Justify why the selected tool is suitable

*Explain which tool is used for the development, and justify the suitability of the tool used in your project.*

>

# **Methodology**

## 3.1 Description of dataset

*Describe the source of the dataset, and the data structures/data dictionary*

>

## 3.2 Applications of the algorithm(s)

*Describe how the selected algorithm(s) or technique(s) is used in your project.*

>

## 3.3 System flowchart

*Draw a simple diagram to illustrate the system design/data flow*

>

## 3.4 Proposed test plan/hypothesis

*Design a simple test plan or state the hypothesis that you want to test in the project*

>

# **Result**

## 4.1 Results

*Demonstrate the results based on the test plan/hypothesis / print screen*

>

## 4.2 Discussion/Interpretation

*Critically discuss the results and interpret the implications*

>

# **Discussion and Conclusion**

## 5.1 Achievements

*Discuss what the project has achieved and state whether it has fulfilled the objectives*

>

## 5.2 Limitations and Future Works

## *Discuss the limitations of the project and what improvements can be done in the future*

>

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# **Reference & Source**

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