

Contract Query ChatBot

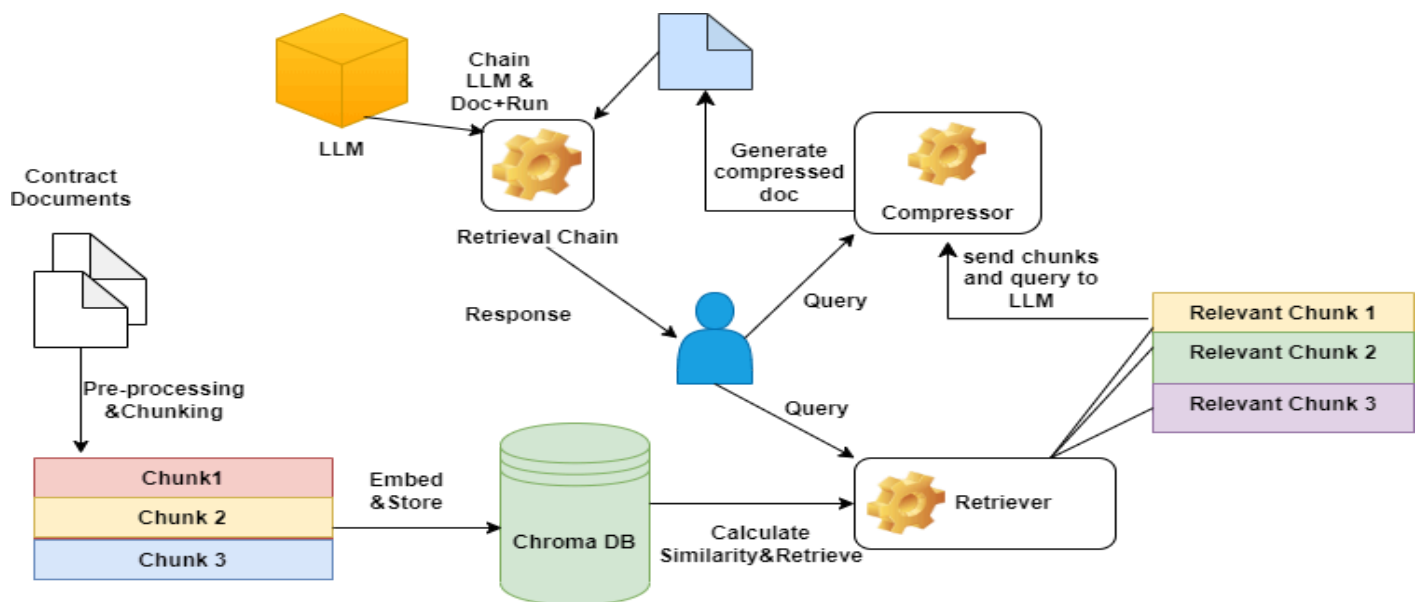
Team Members:

1. Vedant Joshi
2. Shivani Gangarapollu

1. Project Objective

The objective of the Contract Query ChatBot project is to create an intelligent retrieval-augmented system that processes contracts and provides precise answers to queries based on the contents of the documents. This system leverages advanced AI models, embedding generation, and a retrieval mechanism to ensure accurate and relevant responses. The chatbot is designed to make the contract review process more efficient, enabling users to ask questions and get instant responses from large datasets.

2. Project Workflow Diagram



3. Technologies Used

The project utilizes several modern technologies to achieve efficient document retrieval and query response generation:

1. **Python:** The core programming language for scripting and implementation.
2. **LangChain:** Used for workflow management, including document embedding, vector storage, and query response handling.
3. **Streamlit:** A lightweight framework for creating an interactive web-based UI for the chatbot.
4. **ChromaDB:** A vector database that stores document embeddings for fast retrieval.
5. **PyPDF2:** A library for parsing and extracting text from PDF documents.
6. **OpenAI API:** LLMs for generating responses based on document content.

7. **LLM Chain:** A method that connects LLMs to retrieve information more efficiently.
8. **Recursive Text Splitter:** A technique used for splitting large documents into smaller chunks for better embedding generation.

4. Dataset

The dataset for the Contract Query ChatBot consists of 50 contract documents from various companies. These documents include legal agreements between companies and banks regarding private label credit card programs. Each contract contains a variety of sections, such as:

1. **Definitions:** Key terms used throughout the contract.
2. **Plan Operations:** The scope and administration of the credit card program.
3. **Intellectual Property:** Ownership and licensing of trademarks and technology.
4. **Confidentiality:** Data protection measures for both company and bank information.
5. **Termination:** Conditions and procedures for contract termination.

The chatbot uses these contracts to answer specific queries based on the content of these agreements, extracting relevant information from sections regarding account management, intellectual property rights, legal obligations, and financial conditions. The documents are parsed and embedded to make retrieval and response generation more efficient.

5. Brief Explanation of Each Python File

5.1 app3.py

The `app3.py` file serves as the main entry point for the chatbot application. It sets up the vectorstore for storing document embeddings and integrates the Streamlit framework for building a simple user interface. It manages the initialization of the QA retrieval chain using LangChain, ensuring that the chatbot can process queries from users and return relevant results.

5.2 configuration.py

The `configuration.py` file contains important configuration settings for the project. These include directory paths such as where the parsed documents and vectorstore are saved. These settings ensure that the various components of the project can work together smoothly by referencing the correct paths.

5.3 prepare_documents.py

The `prepare_documents.py` file is responsible for parsing documents, cleaning the data, and splitting the text into smaller chunks. This ensures that large documents are processed efficiently, allowing the system to handle and embed them for later retrieval. The document chunks are created using LangChain's Recursive Text Splitter.

5.4 retrieval.py

The `retrieval.py` file handles the core retrieval functionality. It includes methods to save document embeddings to ChromaDB and the main query system which retrieves relevant document chunks based on user input. It also contains the LLM Chain setup that connects the retrieval system to the language model, making it capable of generating responses.

6. Detailed Working of the Project

The project is composed of several key components, each contributing to the overall functionality of the Contract Query ChatBot. Below is a step-by-step explanation of how the project works, from document preparation to query processing and response generation.

1. Document Parsing and Chunking (`prepare_documents.py`):

- File parsing: The `prepare_documents.py` script is responsible for reading and parsing the documents using `PyPDF2` to extract text from PDFs.
- Recursive Text Splitting: Documents are split into smaller chunks using LangChain's Recursive Text Splitter to generate manageable text chunks for embedding.
- Metadata storage: Metadata such as document title, page number, and section are stored alongside the text chunks for later use.

2. Embedding Generation (`retrieval.py`):

- OpenAI Embedding API: Document chunks are passed to the OpenAI API to generate high-dimensional vector embeddings that represent the semantic content.
- Vector Storage with ChromaDB: The embeddings, along with metadata, are stored in ChromaDB for fast retrieval.
- Saving Embeddings: Embeddings are stored in a vectorstore, optimized for similarity searches.

3. Query Processing and Retrieval (`app3.py` and `retrieval.py`):

- User Interface with Streamlit: `app3.py` sets up a Streamlit UI for users to input queries and receive responses.
- Embedding Search in ChromaDB: The system converts user queries into embeddings and searches for relevant document chunks based on cosine similarity.
- Chunk Retrieval: The most relevant document chunks are retrieved from ChromaDB to generate responses.

4. Response Generation (`retrieval.py`):

- LLM Chain for Response: Retrieved chunks are passed into an LLM chain, which uses them to generate a coherent response based on the query.
- Dynamic Response Creation: The response is generated based on the document context, ensuring accuracy.
- Display in UI: The response is presented to the user through the Streamlit UI.

5. Guardrails and Prompt Templates (`retrieval.py`):

- Prompt Templates: Structured prompt templates ensure the chatbot only answers based on the document context.
- Relevance Check: The system evaluates the relevance of retrieved chunks and improves the response generation process.

7. Special Mention: ContextualCompressionRetriever & LLM Chain;How it Improves Retrieval

The **ContextualCompressionRetriever** plays a crucial role in enhancing the Contract Query ChatBot by efficiently condensing the information retrieved from large datasets before passing it to the language model. By filtering out irrelevant or redundant content, this method ensures that only the most pertinent document chunks are passed to the LLM Chain, reducing noise and improving response accuracy.

The **ContextualCompressionRetriever** improves the system by:

1. **Contextual Relevance:** It compresses retrieved document chunks, removing unnecessary data and retaining only the most relevant information, which makes the language model's task easier and more precise.
2. **Efficiency:** By reducing the volume of data processed, it speeds up the retrieval process, minimizing response times and optimizing overall system performance.
3. **Improved Accuracy:** With only the most contextually relevant information being passed to the LLM Chain, the generated responses are more accurate and coherent, making the system more reliable.

This structured workflow, combining the **LLM Chain** and the **ContextualCompressionRetriever**, enhances retrieval by ensuring that the language model works with well-curated data, improving both the precision and efficiency of the chatbot's responses.

8. Guardrails Implementation using Prompt Templates

Guardrails are implemented in the project to ensure that the chatbot's responses are accurate and contextually appropriate. The system applies the following measures:

1. **Prompt Templates:** Structured prompts are used to guide the language model in generating responses. These templates ensure that the model sticks to the context provided by the documents and does not stray into irrelevant territory.
2. **Contextual Focus:** Each prompt ensures that the model only uses the retrieved document chunks to generate responses, avoiding hallucinations or speculation.
3. **Relevance Checks:** The system checks the relevance of each query and makes sure that the answers provided are based on the specific services or domains relevant to the user's input.

9. Future Enhancements

There are several future enhancements that can improve the performance and functionality of the Contract Query ChatBot:

1. **Response Time Optimization:** Fine-tuning the retrieval and embedding generation process can reduce response time, especially for larger datasets.
2. **Support for Additional File Formats:** Expanding the system to handle more file types, such as Word and Excel, will increase its versatility.
3. **Real-time Document Updates:** Implementing real-time document updates using tools like Apache Kafka will allow for more dynamic data handling.
4. **Improved Guardrails:** Developing more sophisticated filtering mechanisms can improve the accuracy of responses and ensure compliance with data privacy standards.
5. **Enhanced User Interface:** Improving the Streamlit UI by adding features like chat history, session saving, and visual feedback will enhance the overall user experience.

6. **Document Referencing:** Implementing a system for referencing documents in responses, such as by providing page numbers or specific sections from the source documents, will increase transparency and allow users to trace the origins of the chatbot's answers, improving trust and usability.

10. Sample Queries

1. What are the key contact details and address for the Company and Bank involved in the contract between Build A Bear and TD BANK?

Answer:



Query: What are the key contact details and address for the Company and Bank involved in the contract between Build A Bear and TD BANK?

Relevant Information Found:

Company: BUILD A BEAR WORKSHOPSCorporation

- Address: 3701 Wayzata Blvd., Minneapolis, MN 55416
- Attn: President, FRS
- With a copy to (which copy shall not BUILD A BEAR WORKSHOPSCorporation constitute notice): Financial and Retail Services 3701 Wayzata Blvd., Minneapolis, MN 55416
- Attn: General Counsel, FRS

Bank: TD Bank USA, N.A.

- Address: 1701 Bank USA, N.A., Cherry Hill, Camden NJ 08034
- Attn: Group Head

Contract: CREDIT CARD PROGRAM AGREEMENT

- Company: BUILD A BEAR WORKSHOPSENTERPRISE, INC.
- Bank: TD BANK USA, N.A.

2. What happens in the event of a default by the Company or the Bank in contract between Dicks Sporting Goods and Bank?

Answer:

In the event of a default by either the Company or the Bank in the contract between Dicks Sporting Goods and Bank, the following actions may occur:

- If the default is by the Company, the Bank may terminate the contract upon written notice if DICKS SPORTING GOODS Corporation does not have a senior unsecured debt rating of at least A or its equivalent from at least two of Moody's, Standard & Poor's and Fitch Ratings.
- If the default is by the Bank, the Company may terminate the contract upon notice upon the occurrence of a Company Event of Default.
- The occurrence of any one or more of the following events (regardless of the reason therefore) shall constitute an event of default by Bank:
 - Bank fails to settle in accordance with Section 7.2, any amount that is not disputed in good faith, within two (2) Business Days after Company shall have given notice thereof by 5 p.m. Eastern.
 - Bank shall no longer be solvent or shall fail generally to pay its debts as they become due or there shall be a substantial cessation of Bank's regular course of business.
- If the Company fails to perform, satisfy or comply with any obligation, condition, covenant or other provision contained in this Agreement for a period of not less than sixty (60) consecutive days due to a Force Majeure Event and such failure shall either have a material and adverse effect on the Program, the Bank Licensed Marks or the Company Licensed Marks, or materially diminish the economic value of the Program to Bank, the Bank may terminate the contract upon notice.
- If the Company or the Bank terminates the contract, the following rights and obligations apply:
 - If the Company terminates the contract, the Company shall have the rights and obligations of a defaulting party under Section 13.4(b).
 - If the Bank terminates the contract, the Company shall have the rights and obligations of a non-defaulting party under Section 13.4(b).
- If the Company or the Bank terminates the contract prior to the Closing Date, the following actions may occur:
 - Company may terminate this Agreement upon notice to Bank on or prior to the Closing Date if a Bank Event of Default shall have occurred.

3. Explain what happens if the Bank defaults in its obligations in contract between Cato Fashions and Bank?

Answer:

Relevant Information Found:

If the Bank defaults in its obligations in the contract between Cato Fashions and Bank, it will constitute an event of default by the Bank. This means that the Bank has failed to fulfill its obligations as outlined in the contract and has breached the terms of the agreement. The contract specifically states that the occurrence of any one or more of the following events (regardless of the reason therefore) shall constitute an event of default by Bank:

- Bank fails to settle in accordance with Section 7.2, any amount that is not disputed in good faith, within two (2) Business Days after Company shall have given notice thereof by 5 p.m. Eastern.
- Bank shall no longer be solvent or shall fail generally to pay its debts as they become due or there shall be a substantial cessation of Bank's regular course of business.
- The OCC or any other regulatory authority having jurisdiction over Bank shall order the appointment of a custodian, receiver, liquidator, assignee, trustee or sequestrator (or similar official) of Bank or of any substantial part of its properties, or order the winding-up or liquidation of the affairs of Bank, and such order shall not be vacated, discharged, stayed or bonded within sixty (60) days from the date of entry thereof.

In summary, if the Bank defaults in its obligations, it will be considered a breach of contract and may result in legal action being taken against the Bank by Cato Fashions. The contract also outlines specific actions that may be taken by regulatory authorities in the event of a default by the Bank.