HelpMate AI

Project Report by Sandeep B.

Objectives

Develop a Semantic Search System
Utilize the RAG pipeline for efficient document retrieval, integrating embedding, search, and generation layers.

Extract and Structure Information
Process and store PDF documents in a structured format, generating vector representations with OpenAI's models.

Implement a Cache Layer
Enhance performance by caching previous queries and results using ChromaDB.

Build a Generative Search System
Develop a robust system capable of accurately answering questions from a policy document.

System Design

RAG Pipeline & Cache Implementation

RAG Pipeline Overview
Integrates Embedding, Search, and Generation layers to retrieve and generate accurate responses.

Embedding Layer
Processes and chunks PDFs, generating vector embeddings stored in ChromaDB.

Search & Rank Layer
Performs semantic similarity searches and re-ranks results using cross-encoders.

Cache Implementation
Enhances performance by caching queries and results, utilizing a similarity threshold.

Implementation

- **Document Processing:** Utilized pdfplumber for text and table extraction, followed by chunking and vector embedding with OpenAI's models.
- **Semantic Search:** Implemented semantic similarity searches using the RAG pipeline and vector database ChromaDB.
- **Cache System:** Developed a cache system with ChromaDB, optimizing the retrieval of previous queries and results.

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Photo by Maik Jonietz on Unsplash

Challenges Faced

- **Data Quality & Preprocessing:** Extracting relevant information from complex insurance documents proved challenging due to varied text structures.
- **Chunking Strategies:** Optimizing chunk size and overlap to maintain context without losing coherence was critical but difficult.
- **Query Understanding & Matching:** Designing relevant queries that required sophisticated understanding and reasoning posed a significant challenge.

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Conclusion

Successful Implementation
HelpMate AI successfully achieved its objectives, implementing a robust semantic search system with the RAG pipeline.

Challenges Overcome
The project addressed significant challenges in data processing, chunking strategies, and query design.

Scalable and Efficient System
The final system is scalable, efficient, and provides accurate information retrieval from complex documents.

Lessons Learned

Efficient Document Processing
Utilizing tools like pdfplumber is crucial for handling complex PDF documents efficiently.

Semantic Search Optimization
Fine-tuning search parameters and thresholds is essential for achieving optimal results.

Cache Management
Implementing an effective caching strategy significantly improves system performance.