Dynamic Knowledge Expanding AI Chatbot

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1. Introduction

This internship project involved designing and developing a dynamic chatbot system capable of expanding its knowledge base automatically over time. The chatbot uses modern natural language processing (NLP) techniques combined with a vector database to deliver intelligent, context-aware responses.

2. Background

Chatbots are widely used in customer support, education, and automation. However, most bots rely on static datasets. This project aimed to overcome that limitation by implementing a developer-updating knowledge base by vector embeddings using FAISS and integrated with a local language model (LLaMA 3) to avoid dependency on paid APIs like OpenAI.

3. Learning Objectives

- Understand how to build a chatbot using open-source LLMs.
- Hovered over many chatbot API and there different code snippets and functions
- Learn to integrate vector databases (FAISS) for document retrieval.
- Developer can update the knowledge according to the trend. That means automatic update of chatbot knowledge for the user.
- Develop a simple and usable chat interface using Streamlit.

4. Activities and Tasks

- Researched and selected tools: FAISS, SentenceTransformers, LLaMA 3.
- Built a data pipeline to convert documents into vector embeddings.
- Developed a script (update_knowledge.py) for dynamic updates to the vector database.
- Created a chatbot interface using Streamlit.
- Integrated retrieval-augmented generation (RAG): query → embed → search → respond.

- Successfully tested multiple knowledge topics, including "Lifecycle of a Frog."

5. Skills and Competencies

- Technical:
  - Natural Language Processing (RAG, embeddings, LLM integration)
  - Python scripting, FAISS indexing, Streamlit UI design
  - Open-source model deployment (LLaMA via Ollama)
- Soft Skills:
  - Problem-solving and debugging
  - Time management and task planning
  - Adaptability when dealing with API limitations

6. Feedback and Evidence

The chatbot successfully retrieved context-aware answers based on new documents added after initial deployment. Demonstrated the chatbot’s use with various .txt documents, showing relevant answers after knowledge base updates.

A screenshot is been provided in the “sample” folder of the task folder itself.

7. Challenges and Solutions

1. Subscription ended for OpenAI API

SOL- First the whole chatbot was made using OpenAI API. I searched for free APIs other then Google Gemini, and mistaken with OpenAI free API for base model. Soon I find the problem(for the free version also you have certain limits) and changed the whole code that supports LLaMA API and model. That was free and can be used locally.

2. Complexity of vector databases.

SOL- learned FAISS and installed it for simplicity, speed and performance. I got great help from YouTube and Chat GPT for learning about this.

3. Auto-updating knowledge without complexity.

SOL- Made a python script to update the knowledge whenever there is a new knowledge base. First I tried an automatic approach using the OpenAI API itself but failed. So I build this code where the model will show no change at the user end but the data can be updated form the developer end with just running this one code – “update_knowledge.py”.

8. Outcomes and Impact

- Built a fully functional chatbot that can evolve over time without manual retraining.
- Created a base architecture that can be extended for customer service, research bots, or knowledge assistants.
- Demonstrated a complete pipeline from data ingestion to contextual generation using open-source tools.

9. Conclusion

This internship allowed me to explore the cutting-edge area of dynamic chatbots and retrieval-augmented generation. I was able to explore different AI chatbot API and use them by my self. It consumed time but was worth it. I successfully developed a system that learns from new data without retraining, operates offline, and offers meaningful interactions — all while using open-source models and libraries. The experience significantly boosted both my technical and analytical skills. I gained the knowledge on how an AI chatbot works from backend and how to code them in a manner that they can give a customized answer according to the data it’s been trained on.