Dr. Babasaheb Ambedkar Technological University, Lonere

Prompt Engineering RAG Assistant

Using Google Gemini and Streamlit

B.Tech in Computer Engineering

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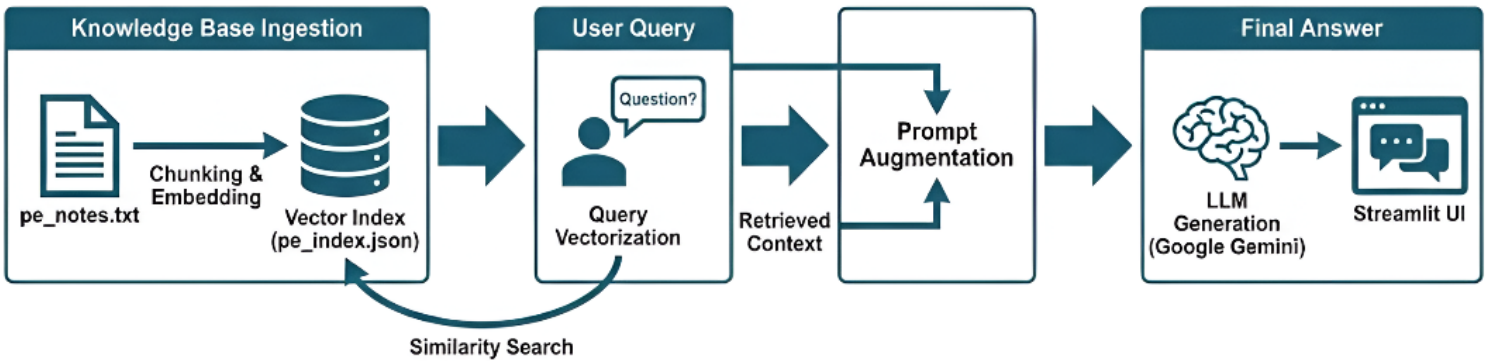
Introduction

- **Project Overview**
  - A chatbot designed to act as a university-level tutor.
  - Specifically tailored for **Prompt Engineering** concepts.
  - Helps students prepare for exams using a custom knowledge base.
- **Core Technology**
  - Built using **Retrieval-Augmented Generation (RAG)**.
  - Powered by **Google Gemini** models.
  - Interface developed in **Streamlit**.

Understanding RAG

- **Definition**
  - RAG stands for Retrieval-Augmented Generation.
  - It allows LLMs to reference an authoritative knowledge base outside of their static training data before generating a response.
- **The Problem it Solves**
  - Standard LLMs may "hallucinate" or provide outdated information.
  - RAG ensures answers are grounded in specific, domain-relevant documents.

Workflow Visualization



Project Implementation Details

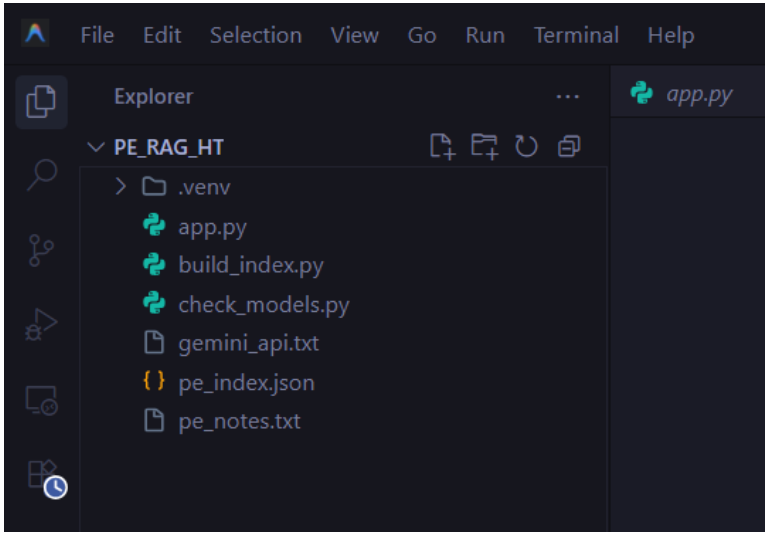
Models Used:

- **Embeddings:** `models/text-embedding-004`
- **Generation:** `models/gemini-2.0-flash`

Process:

1. **Prepare:** Notes are stored in `pe_notes.txt`.
2. **Index:** `build_index.py` vectorises notes into `pe_index.json`.
3. **Chat:** `app.py` retrieves context and generates answers via Streamlit.

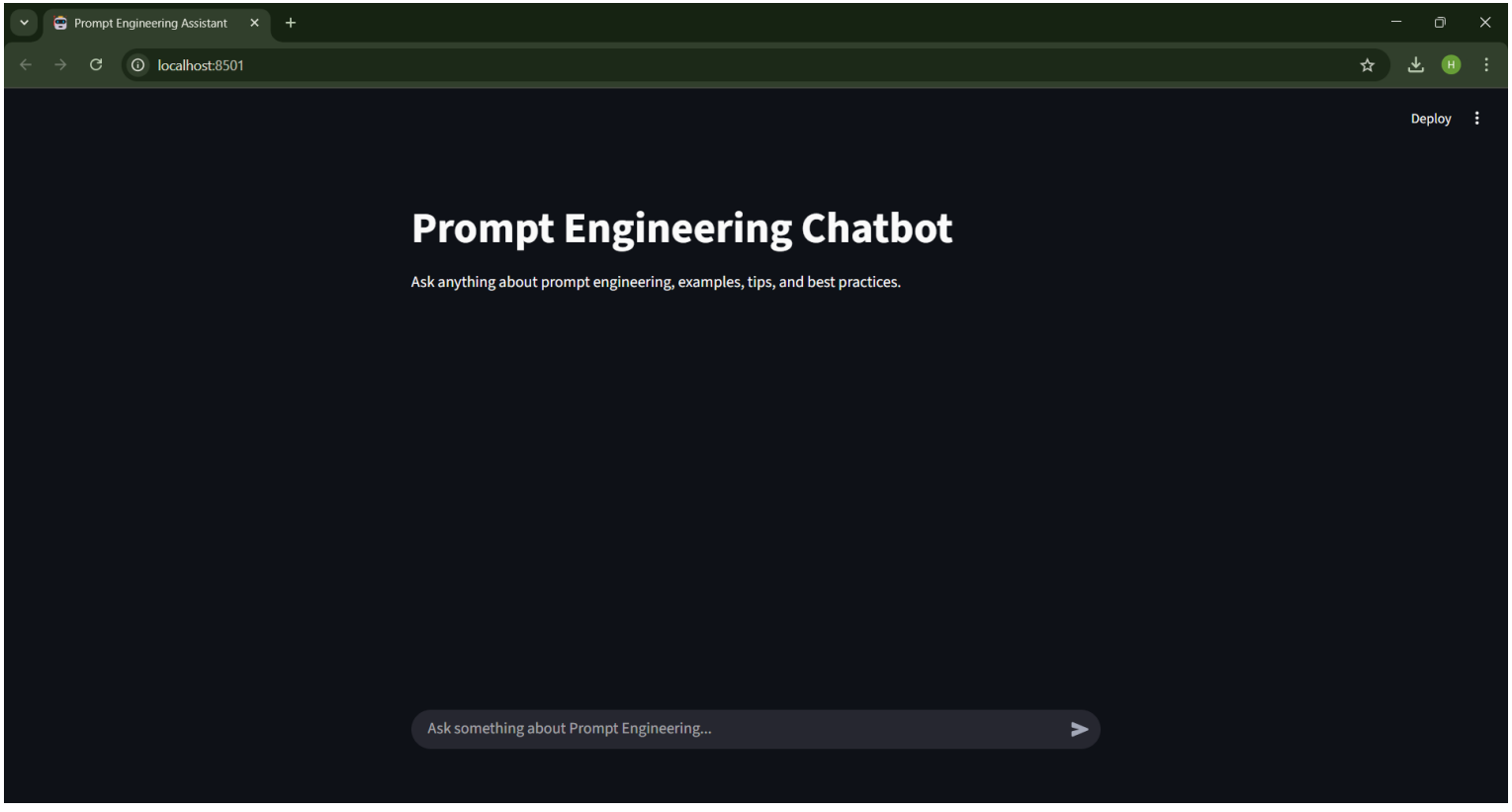
File Structure



Key Files:

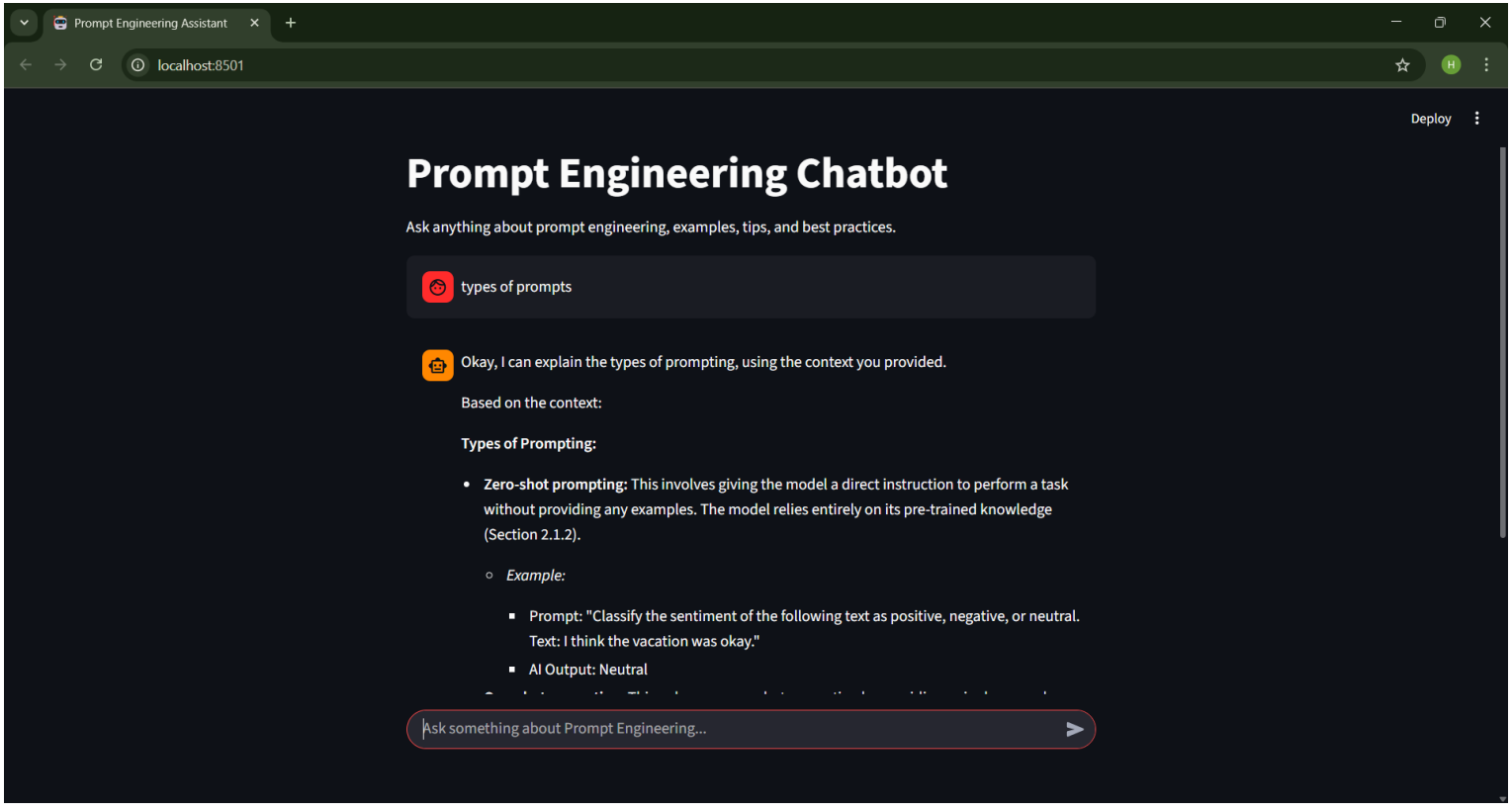
- `app.py`: Main UI & logic.
- `build_index.py`: Creates embeddings.
- `pe_notes.txt`: Knowledge base.
- `pe_index.json`: Vector store.
- `gemini_api.txt`: API Key.

Application Demo: Home Screen



The Streamlit Interface ready for queries.

Application Demo: Chat Response



The chatbot retrieving context and answering a query.

Key Features & Advantages

Features

- Custom Knowledge Base
- Fast responses (Gemini Flash)
- Interactive Web UI

Advantages

- **Accuracy:** Answers are based strictly on provided notes.
- **Relevance:** Tailored specifically for university exams.
- **Extensibility:** Easy to update notes.

Limitations

- **Dependency:** Requires an active Internet connection and valid Google Cloud API Key.
- **Context Window:** Very large knowledge bases may require more complex chunking strategies.
- **Domain Specific:** The chatbot is only as good as the quality of the notes provided in the text file.

Conclusion

- This project demonstrates how RAG can transform a general-purpose LLM into a specialized exam tutor.
- By leveraging **Google Gemini's** advanced embeddings and generation capabilities, we provide students with accurate, context-aware assistance for Prompt Engineering.

Thank You