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Practical 9

Problem Statement

The objective of this assignment is to develop two types of chatbots: an AI-powered chatbot using the Gemini API and a rule-based FAQ chatbot. These chatbots aim to assist users by providing accurate responses to frequently asked questions, helping understand AI integration, context handling, and user interaction.

Objectives

• Understand AI-based and rule-based chatbot development.
• Learn how to integrate Generative AI using APIs.
• Implement a simple rule-based system using string similarity.
• Handle user interactions and exit commands effectively.

Theory

AI-Based Chatbot (Gemini API)
The AI-based chatbot uses Google's Generative AI model (Gemini). It leverages a knowledge base to generate accurate responses to user queries.

Rule-Based FAQ Chatbot
The rule-based chatbot is a simpler system that uses a list of predefined questions and answers. It determines the best answer based on string similarity between user input and stored questions.

Methodology

AI-Based Chatbot Steps:

1. **Import Libraries:** Import necessary libraries from `google.generativeai`.
2. **Build Knowledge Base:** Read context from a description file.
3. **Create Prompts:** Embed user questions into the knowledge base using a function.

4. **Generate Responses:** Send the prompt to Gemini API and receive AI-generated answers.
5. **Handle Exit Commands:** Recognize commands like 'quit', 'exit', or 'bye' to end the chat.

Rule-Based Chatbot Steps:

1. **Normalize Input:** Convert user input to lowercase and remove extra spaces.
2. **Compare Queries:** Use `SequenceMatcher` to calculate similarity with stored questions.
3. **Return Answer:** If similarity exceeds a threshold, return the best-matched answer.
4. **Low Confidence:** If no match, respond with a fallback message.

Working Principle / Algorithm

AI-Based Chatbot:

1. Initialize API and knowledge base.
2. Take user input.
3. Create prompt with context.
4. Send prompt to Gemini model.
5. Receive and display AI-generated response.
6. Repeat until exit command is given.

Rule-Based Chatbot:

1. Initialize knowledge base with question-answer pairs.
2. Take user input.
3. Normalize input.
4. Calculate similarity with stored questions.
5. Return answer if threshold met; else return fallback.
6. Repeat until exit command is given.

Advantages

• **AI Chatbot:** Flexible, capable of handling varied user queries.
• **Rule-Based Chatbot:** Stable, predictable, and easy to implement.
• Improves understanding of prompt design, context handling, and API integration.

Disadvantages

• **AI Chatbot:** Requires API access and may generate unexpected responses.
• **Rule-Based Chatbot:** Limited to predefined questions; cannot handle unseen queries effectively.

Conclusion

These two chatbot approaches provide complementary learning experiences. The AI-based chatbot offers flexibility and advanced response generation, while the rule-based chatbot provides stability and control. This project helped in understanding prompt design, context handling, and user interaction in practical AI systems.