**Approach & Design Decisions**

**1. Hybrid Chatbot Design**

To balance accuracy and flexibility, I adopted a **hybrid approach**, combining:

* **Rule-based (FAQ Matching)**: For handling predefined questions efficiently.
* **AI-driven (DialoGPT Model)**: To generate responses dynamically when an exact match isn’t found.

**2. Improving User Input Handling**

* Implemented **fuzzy string matching** using fuzzywuzzy to match queries even when users phrase them differently.
* Adjusted the matching threshold to **70%** to reduce incorrect matches.
* Enhanced speech recognition by allowing **ambient noise adjustment** and retrying in case of errors.

**3. Optimized Speech-to-Text & Text-to-Speech**

* Used Google’s **Speech Recognition API** for robust speech-to-text conversion.
* pyttsx3 was chosen for TTS as it runs offline and provides better control over voice parameters.

**4. Model Selection for AI Responses**

* microsoft/DialoGPT-medium was integrated for conversational responses.
* The model is capable of generating responses based on user prompts, though it benefits from fine-tuning for better contextual accuracy.

**Final Thoughts & Next Steps**

While this chatbot provides a functional voice assistant, future improvements could include:

* **Fine-tuning DialoGPT** on domain-specific datasets for better contextual awareness.
* **Integrating Whisper (OpenAI)** for improved speech recognition accuracy.
* **Using a Neural TTS Engine (like ElevenLabs or Google WaveNet)** for more natural voice responses.

This project serves as a stepping stone towards building more sophisticated AI-driven voice assistants, merging NLP advancements with real-time speech interactions.