Voice-Enabled Customer Service Agent Assignment

Project Overview

This project is a **voice-enabled AI customer service agent** designed for an **e-commerce platform**. The system assists customers by:

- **Order Tracking** – Retrieves order status using an order number.
- **Return Requests** – Validates return policies before approving return requests.
- **Conversational Agent** – An AI-powered chatbot that understands and responds to customer queries.
- **Voice Input** – Converts speech to text for hands-free interactions.

The system is built using **FastAPI, PostgreSQL, Hugging Face models, and Streamlit for the UI**.

Architecture

1. Frontend (Streamlit)

- Provides an intuitive user interface for **order tracking, return requests, and chatbot interactions**.
- Sends API requests to the FastAPI backend.

2. Backend (FastAPI)

- Exposes API endpoints for handling:
    - Order tracking
    - Return request validation
    - Conversational AI responses
    - Voice processing
- Integrates with PostgreSQL for order and return request management.

3. Database (PostgreSQL)

- Stores order details, including order numbers, status, customer information, and return requests.

4. LLM Integration (Hugging Face Transformers)

- Uses **Hugging Face models** for **intent detection and conversational responses**.
- Processes customer queries to determine whether they relate to **order tracking** or **return requests**.

5. Retrieval-Augmented Generation (RAG) for Return Policies

- Implements **vector search** using FAISS and Hugging Face embeddings.
- Retrieves relevant return policies based on customer input.
- Uses a **similarity score threshold** to validate return eligibility.

6. Voice Processing (Google Speech Recognition)

- Captures **spoken queries** and converts them into text.
- Passes the transcribed text to the AI agent for processing.

Implementation Details

1. Order Tracking

- Customers enter an **order number**.
- The system queries the **PostgreSQL database** to retrieve order details.
- The response includes **order status, estimated delivery date, and customer information**.

2. Return Requests

- Customers enter an **order number and reason for return**.
- The system retrieves **return policies** using **RAG-based retrieval**.
- A **similarity score** is computed to check if the return is **eligible**.

3. Conversational Agent

- The system **detects user intent** (e.g., "track order" or "return request").
- Based on the intent, it **calls the appropriate API** (tracking or returns).
- If the request is unrelated, the agent **provides a default response**.

4. Voice Input Processing

- Uses **Google Speech Recognition** to convert **speech to text**.
- The converted text is passed to the **AI agent** for processing.

Challenges Faced

1. LLM Processing Issues

- The model **does not work efficiently on a CPU**.
- No GPU available for **fast inference**.
- Investigating **optimized models (e.g., TinyLlama or quantized models)**.

2. Speech-to-Text Issues

- Google Speech Recognition sometimes **fails to capture accurate transcriptions**.
- Need to explore **alternative open-source models** for **offline speech recognition**.