Code Documentation

Overview

The Healthcare Translation Web App is a web-based application designed to facilitate real-time, multilingual communication between patients and healthcare providers. Built using Python and Streamlit, the app leverages generative AI for accurate transcription and translation, ensuring effective and secure communication in a healthcare setting.

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Technologies and Libraries

- **Streamlit**: A Python framework for building interactive web applications.
- **OpenAI API**: Utilized for natural language processing tasks, including transcription and translation.
- **gTTS (Google Text-to-Speech)**: Converts translated text into audible speech.
- **audio_recorder_streamlit:** Enables audio recording functionality within the Streamlit app.

Code Structure

Page Configuration

- **st.set_page_config:** Sets the basic configuration of the Streamlit app, including title, icon, layout, and sidebar state.

OpenAI API Initialization

- **API Key Retrieval:** Fetches the OpenAI API key from Streamlit's secrets for secure access.
- **Client Initialization:** Creates an instance of the OpenAI client for API interactions.

Function Definitions

1. **translate_text(text, target_lang):**

- **Purpose**: Translates the given text into the specified target language using OpenAI's language models.
- **Parameters**:
    - text (str): The text to be translated.
    - target_lang (str): The language to translate the text into.
    - Returns: Translated text or None in case of an error.

2. **text_to_speech(text, lang_code):**

- **Purpose**: Converts the provided text into speech audio using gTTS.
- **Parameters**:
    - text (str): The text to be converted into speech.
    - lang_code (str): The language code for the speech synthesis.
    - Returns: A BytesIO object containing the audio data or None in case of an error.

4. Main Application Function

- **Title and Subtitle:** Displays the main heading and subheading of the app.
- **Language Selection:** Provides dropdown menus for selecting source and target languages.
- **Audio Input Handling:**

    - Records audio input from the user.
    - Transcribes the audio using OpenAI's Whisper model.
    - Translates the transcribed text.
    - Converts the translated text back to speech.

- **Text-to-Speech Section:** Allows users to manually input text and convert it to speech.

AI Tools Integration

OpenAI API

- **Transcription**: Uses OpenAI's Whisper model (whisper-1) to transcribe spoken language into text.
- **Translation**: Utilizes a ChatGPT-like model (GPT-4o-mini) to translate the transcribed text into the target language.
- **Error Handling:** Implements try-except blocks to catch and display errors related to API calls.

gTTS (Google Text-to-Speech)

- Converts translated text into speech audio.
- Handles multiple languages by mapping language names to their respective codes.

Security Considerations

API Key Management

- **Streamlit Secrets:** The OpenAI API key is securely stored using Streamlit's secrets management, preventing exposure in the codebase.

Data Privacy

- **Patient Confidentiality:** Ensures that all audio and text data are processed securely without storing any sensitive information.
- **In-Memory Processing:** BytesIO is used to handle audio data in-memory, reducing the risk of data breaches.

Error Handling:

- Provides user-friendly error messages without exposing sensitive system information.
- Implements error handling for transcription and translation failures to maintain application stability.

Deployment Security

- **Platform Choice:** Deploys the application on secure platforms like Streamlit Community Cloud, ensuring adherence to best security practices.
- **HTTPS:** Ensures that all data transmission is encrypted using HTTPS protocols.

Deployment

- **Platform**: The app is deployed on a platform such as Vercel, V0, or Cursor.
- **Live Link:** A publicly accessible URL allows users to access the web application.
- **Continuous Integration**: Utilizes deployment platforms' CI/CD pipelines to ensure seamless updates and maintenance.