**Code Documentation & User Guide**

**1. Code Documentation**

**1.1 Code Structure**

* **Frontend (HTML, CSS, JavaScript)**
  + index.html: Main UI of the application.
  + style.css: Styles the UI for a modern, user-friendly experience.
  + script.js: Handles form submission, fetch API calls, and audio playback.
* **Backend (Flask API)**
  + app.py: Main Flask application handling requests and responses.
  + speech\_to\_text.py: Converts uploaded audio into text using AI.
  + translator.py: Translates extracted text using AI-based translation models.
  + text\_to\_speech.py: Converts translated text back into speech for playback.
* **Dependencies (Requirements)**
  + Flask: Web framework for handling requests.
  + SpeechRecognition: Processes audio input.
  + Google Translate API: Handles text translation.
  + gTTS: Converts translated text to speech.

**1.2 AI Tools Used**

* **Speech-to-Text (STT)**
  + Uses libraries like **Whisper API, SpeechRecognition** to transcribe speech.
* **Translation**
  + Uses **Google Translate API** or **OpenAI's translation models** for multilingual translation.
* **Text-to-Speech (TTS)**
  + Uses **Google Text-to-Speech (gTTS)** to convert translated text to spoken audio.

**1.3 Security Considerations**

* **File Handling**
  + Accepts only .wav, .mp3 formats to prevent malicious file uploads.
  + Restricts file size to avoid server overload.
* **Input Validation**
  + Sanitizes user inputs to prevent **XSS (Cross-Site Scripting) attacks**.
* **API Security**
  + Limits requests per user to prevent **DDoS attacks**.
  + Uses **HTTPS** to encrypt communication between the frontend and backend.

**2. User Guide**

**2.1 How to Use the App**

1. **Upload Audio**
   * Click **'Choose File'** and select a .wav or .mp3 file.
   * The file name will appear once selected.
2. **Select Input & Target Language**
   * Choose the language of the uploaded audio.
   * Select the language to translate into.
3. **Click Translate**
   * Press the **'Translate'** button to process the audio.
   * The app will transcribe, translate, and display the results.
4. **Play Translated Speech**
   * Click **'🔊 Speak'** to hear the translated audio.

**2.2 Troubleshooting**

* **File Not Uploading?**
  + Ensure the file is in .wav or .mp3 format.
  + Check if the file size is too large.
* **No Translation Output?**
  + Ensure the correct input language is selected.
  + Retry after refreshing the page.
* **Audio Playback Not Working?**
  + Check if the browser supports audio playback.
  + Try another browser if needed.

This documentation provides a comprehensive guide to the app’s **code structure, AI tools, and security measures**, along with a **user-friendly guide** for ease of use. 🚀