ARCESIUM X UMEED HACKATHON

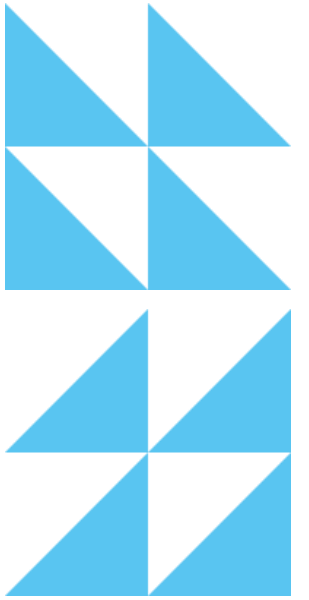MENTAL HEALTH

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AI CHATBOT :SAHAYATA

This project implements a conversational chatbot named Sahayata with memory using the **Groq API**. Sahayata is designed to act as a virtual psychiatrist, engaging users in meaningful conversations while analyzing their emotional states based on voice inputs. The chatbot is integrated with speech recognition and audio analysis to infer stress, confidence, and anxiety levels from voice recordings.
The frontend for Sahayata is built using **React**, ensuring a seamless user experience with an **interactive UI**.

UI:
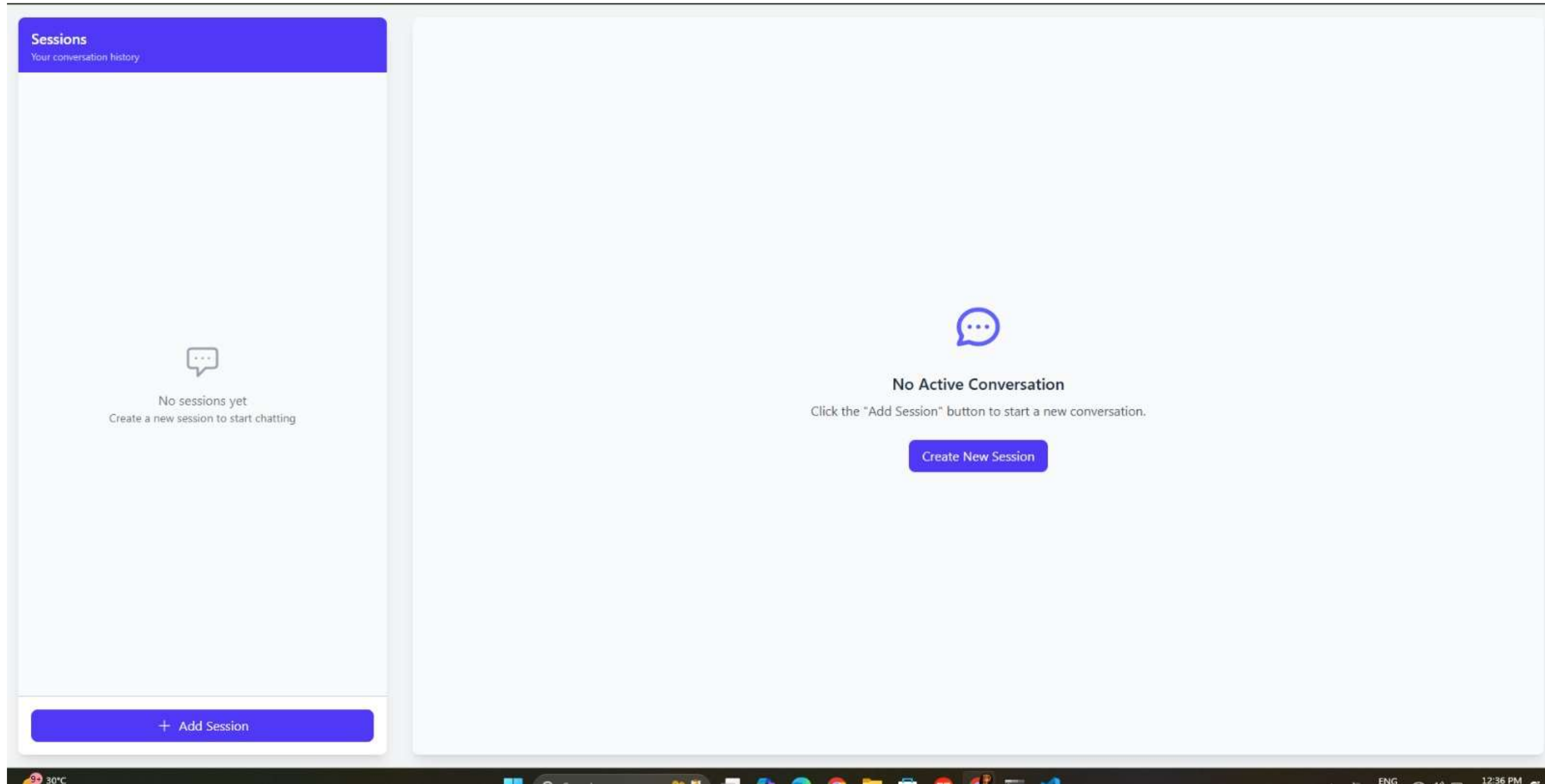
FEATURES:

- **Conversational AI with Memory** → Maintains chat history for context-aware interactions.
- **Voice Emotion Analysis** → Extracts pitch, volume, and speaking rate from audio to assess user emotions.
- **Session-Based Conversation Management** → Assigns unique session IDs for handling multiple conversations separately.
- **Conversation History Storage** → Logs previous interactions to enhance user experience and continuity.
- **Personalized Agent** → Adapts responses based on user demographics while ensuring data privacy.
- **Interactive & Modern UI** → Built with React for a seamless, responsive, and engaging user experience.
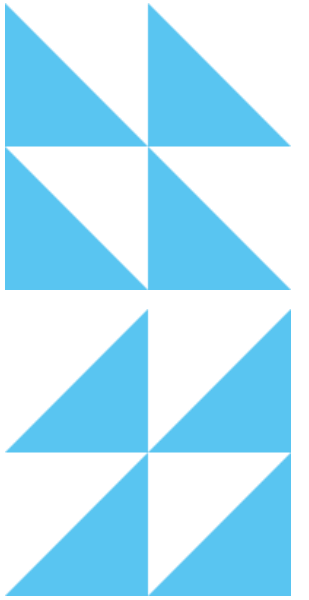
CODE BREAKDOWN

1. **Conversational Chatbot**
   - Initializes a Groq-based chatbot with a predefined system prompt.
   - Manages chat history using ChatMessageHistory.
   - Implements a conversation flow that dynamically adjusts based on user inputs.
   - Session-based history management allows different users to have separate interactions.
   - User-friendly response generation that ensures the conversation remains engaging and supportive.

2. **Voice Emotion Analyzer**
   - Extracts voice features such as pitch, volume, and speaking rate using Librosa.
   - Transcribes audio to text using SpeechRecognition.
   - Analyzes emotions based on both transcribed text and extracted audio features.
   - Provides structured insights on stress, confidence, and anxiety levels.

Workflow of the Conversational Chatbot

1.**User Inputs Text** → The user enters a query in the chat interface.

2.**Demographic Data** is Analyzed → The bot assesses user-specific factors like age, language, and location to personalize responses.

3. **Mental Factors** (Stress, Confidence, etc.) are Analyzed → Sentiment analysis detects emotional states to tailor empathetic responses.

4.**Chat History** & Versioning is Stored → Previous interactions are logged to maintain context and improve future responses.

5.**Data is Sent to GPT** → The processed input, along with user context, is sent to GPT for response generation.

6.**GPT Processes the Data and Generates a Response** → The LLM formulates a relevant and coherent reply based on context and knowledge.

7.**Response is Sent Back to the User** → The chatbot displays the generated response, ensuring a seamless conversational experience.
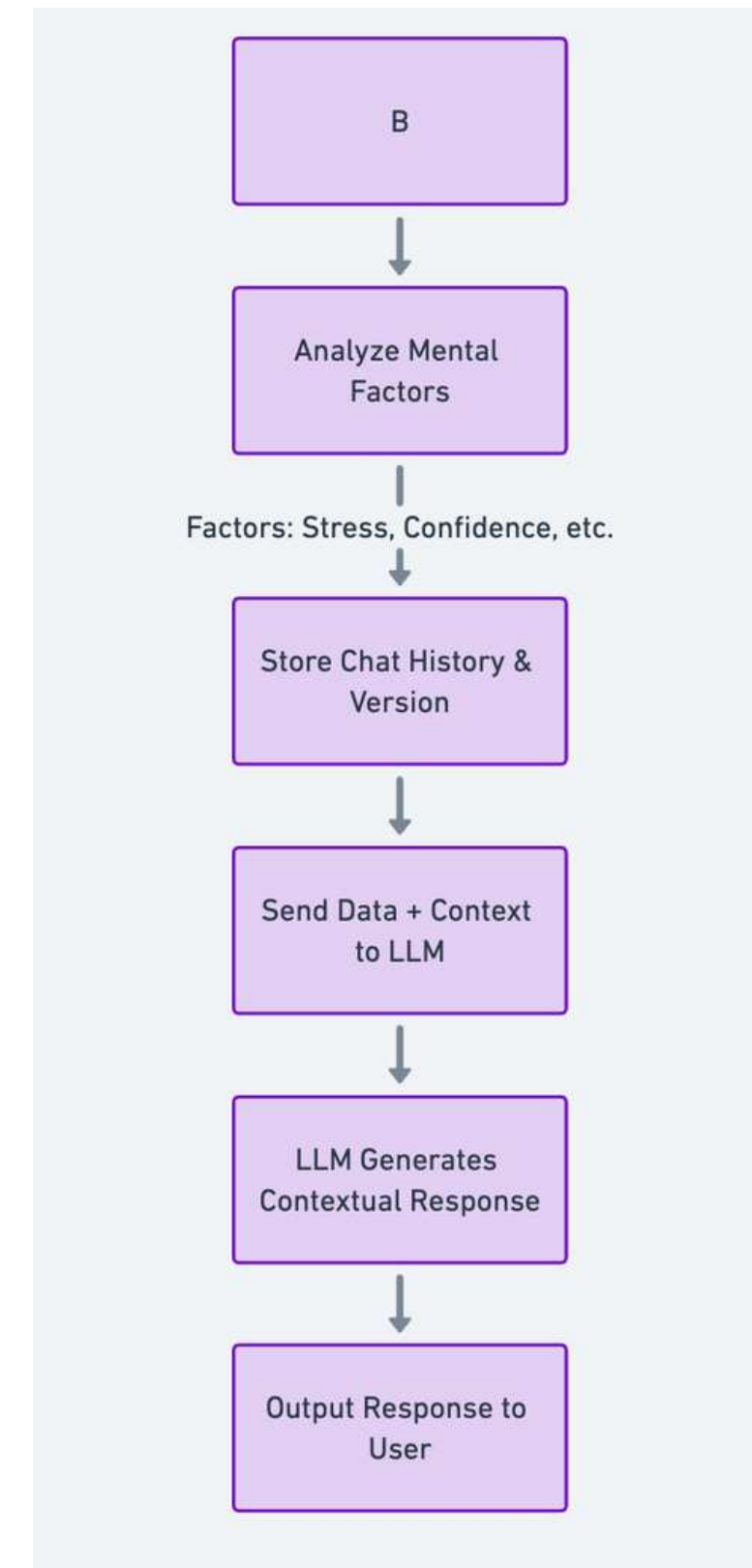
WORKFLOW OF VOICE ASSISTING AGENT

- Receive and process the .wav file.
- Clean and enhance audio quality.
- Convert speech into accurate text.
- Extract meaning and intent from text.
- Mental Factors Analysis → Detect stress, emotions, and tone.
- Feed Data to Conversation Agent → Provide analyzed data for interaction.
- Conversation Agent Processes Input → Interpret and understand user input.
- Generate Response → Craft a meaningful and context-aware reply.
- End → Deliver the final response to the user.
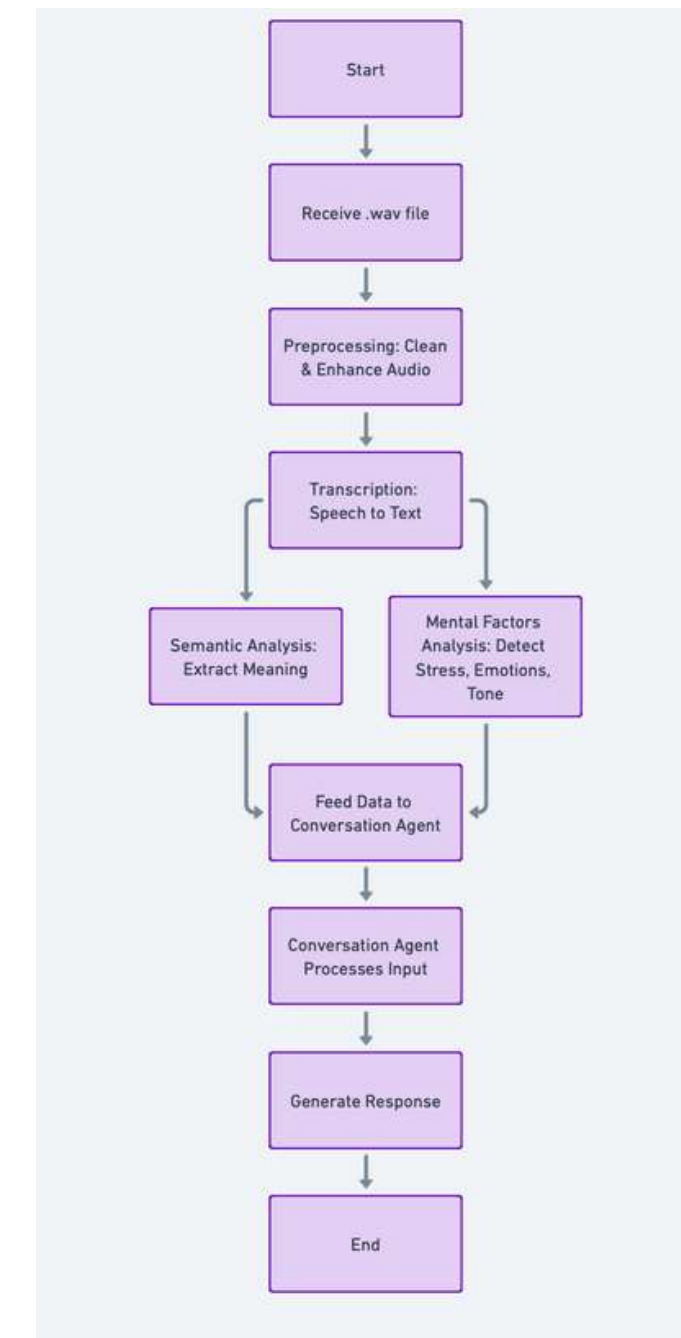
USAGE

Chatbot Interaction:

1. Enter a session ID (default: default_session).
2. Input a message in the chatbox.
3. View the chat history with assistant responses.

Voice Emotion Analysis:

1. Call the process_audio(audio_path) function with an audio file.
2. Get the following insights:
    - Transcription of the speech.
    - Pitch, volume, and speaking rate extracted from the voice.
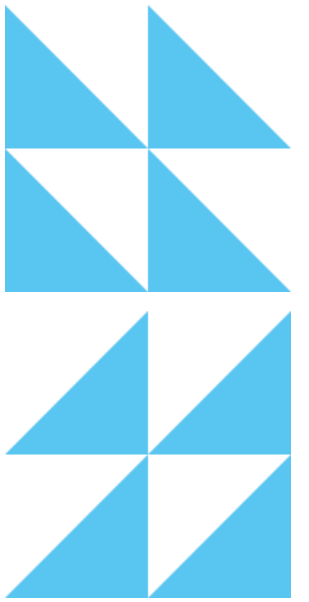   - Emotional analysis, including stress and confidence levels.

Example Output (Voice Analysis)

```json
{
  "emotion_analysis": {
    "stress_level": 7,
    "confidence_level": 5,
    "anxiety_level": 6,
    "mood": "negative",
    "emotional_indicators": ["nervous tone", "fast speech"
  },
  "audio_features": {
    "pitch": 220.5,
    "volume": 0.03,
    "speaking_rate": 0.08
  },
  "transcription": "I feel really overwhelmed and stressed
}
```

FUTURE IMPROVEMENTS

Future Advancements for the Conversational AI Agent

- **Implementing RAG (Retrieval-Augmented Generation)** → Enhancing AI responses by integrating real-time knowledge retrieval for more accurate and context-aware interactions, we can use **pyschological papers** and books for the **vector database**.
- **multilinguality and other sign languages :** to cater larger audience cuz mental health is a bigger issue.
- **Collaboration with Medical Aid** → Integrating with healthcare providers to offer medical assistance, symptom analysis, and emergency response guidance.
- **Enhanced Security Measures** → Strengthening data encryption, user authentication, and compliance with privacy regulations to ensure secure interactions.
- **Multi-Modal data**:WE CAN INCORPORATE THE **FACIAL INPUT** ALONG WITH THE AUDIO INPUT TO MORE PERSONALISED THE INPUT

THANK YOU