Multi-Modal Emotion Recognition for Personalized Music Therapy

📌 Project Overview

Multi-Modal Emotion Recognition for Personalized Music Therapy is an innovative system designed to provide personalized music therapy through two distinct modules:

Facial Emotion Recognition: Detects user emotions via facial expressions and recommends corresponding music from YouTube.

Physiological Monitoring: Uses a MAX30102 sensor to measure heart rate and SpO2 levels for users with disabilities, automatically playing music based on their physiological state.

The system integrates real-time sensor data processing, emotion detection, and adaptive music selection to enhance user well-being.

⚙️ Requirements

Before running the project, ensure the following tools and libraries are installed:

- Python 3.8+
- Node.js (for the frontend)
- Arduino IDE (for the hardware component)
- pip
- Virtualenv (optional but recommended)

Python Libraries (Backend)

Install required libraries with the following command:

```
pip install -r requirements.txt
```

- Flask
- OpenCV (cv2)
- TensorFlow/Keras

- google-api-python-client
- python-dotenv
- numpy

Frontend Dependencies

Navigate to the frontend directory and run:

npm install

Key dependencies include:

- React.js
- TypeScript
- Chart.js
- xlsx (for Excel file handling)
- WebSocket (for real-time communication)

🛠️ How to Run the Project

Backend (Flask Server)

1. Clone the repository:

   git clone https://github.com/PappuWalker/Multi-Modal-Music-Therapy.git

   cd Multi-Modal-Music-Therapy/backend
2. Install all dependencies:
   ```
   pip install -r requirements.txt
   ```
3. Create a .env file and add your YouTube API key:
   YOUTUBE_API_KEY=your_api_key_here
4. Run the Flask server:
   python app.py
5. Frontend (React App)
   cd ../frontend
   npm install
   npm start

🧾 Input Format

- Facial Emotion Module: Users allow camera access for real-time emotion detection.

- Physiological Monitoring Module: Users place their finger on the MAX30102 sensor to measure heart rate and SpO2 levels.em processes this input and returns personalized course and tutorial recommendations.

📤Output

- Facial Emotion Module:
  - Detected emotion (Happy, Sad, Angry, Neutral, Surprised).
  - Recommended music based on the detected emotion.
- Physiological Monitoring Module:
  - Real-time heart rate and SpO2 readings.
  - Calculated stress score and stress level (Low, Elevated, High).

📚 Project Structure

```
Multi-Modal-Music-Therapy/
├── backend/
│   ├── app.py              # Main Flask application
│   ├── create_model.py     # Emotion detection model creation
│   ├── requirements.txt    # Python dependencies
│   └── .env                # Environment variables (API keys)
├── frontend/
│   ├── src/
│   │   ├── App.tsx         # Main React component
│   │   ├── components/
│   │   │   ├── Charts.tsx  # Data visualization
│   │   │   ├── DataDisplay.tsx # Real-time data display
│   │   │   └── SerialConnection.tsx # WebSocket communication
│   ├── public/             # Static files
│   └── package.json        # Frontend dependencies
├── hardware/
│   └── oximeter_max30102.ino # Arduino sketch for sensor data
└── README.md               # Project documentation
```

👨‍💻Contact

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