Implementation Documentation

Project Title: Emotion-Based Music Recommender System
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1. Overview of the Program

This project is an AI-based system that detects a user's facial emotion from an uploaded image or webcam capture and recommends suitable music based on the detected mood.

The program uses the **DeepFace** library for emotion detection and maps each emotion to a predefined playlist of songs.
The final output displays:

- Detected dominant emotion
- Confidence score
- Emotion probability breakdown
- Music recommendations with YouTube links

The entire implementation is done in **Google Colab**.

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2. Libraries and Frameworks Used

Library	Purpose
DeepFace	Facial emotion detection
OpenCV (cv2)	Image handling and preprocessing
Matplotlib	Displaying images (optional)
NumPy	Numerical operations
IPython / JavaScript	Webcam capture inside Colab
Gradio (optional)	Simple UI interface
Google Colab environment	Running the complete project

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3. How the Program Works

Step 1: Image Input

The program allows two input methods:

1. Upload an image (JPG, PNG, JPEG)
2. Capture an image using the webcam (JavaScript in Colab)

Step 2: Preprocessing

- Image is loaded using OpenCV.
- Face is detected.
- `enforce_detection=False` ensures no crash even if the face is partially visible.

Step 3: Emotion Detection

Using DeepFace:

- The image is passed to `DeepFace.analyze()`
- The result contains:
    - Dominant emotion
    - Confidence %
    - Probabilities for all emotions

Step 4: Emotion-to-Music Mapping

Each emotion has its own playlist. Example:

- **Happy:**
  Blinding Lights, Get Lucky, Happy
- **Sad:**
  Lovely, Someone You Loved
- **Angry:**
  Lose Yourself, In The End
- **Fear:**
  Fix You, Breathe Me
- **Neutral:**
  Ocean Eyes, Mockingbird
- **Surprise:**
  Starboy, Bad Guy

These songs include titles, artists, and YouTube links.

Step 5: Output Display

The program shows:

- Detected emotion
- Accuracy/confidence score
- Bar graph (optional)
- Playlist for the detected mood

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4. Functions Used

1. `analyze_image(image_path)`

Purpose:
Takes an image path, analyzes the face, extracts emotions.

Returns:
A dictionary containing:

- dominant emotion
- probabilities
- confidence

2. `get_music_recommendations(emotion)`

Purpose:
Returns a list of songs based on detected emotion.

3. `capture_from_webcam()`

Purpose:
Uses JavaScript to capture webcam images inside Google Colab.

4. `display_results()`

Purpose:
Displays:

- Image
- Detected emotion
- Confidence
- Playlist

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5. Input Format

The program accepts:

- JPG
- PNG
- JPEG
- Webcam-captured images

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6. Output Format

The output includes:

- Detected emotion (string)
- Confidence score (%)
- Emotion probability breakdown
- List of recommended songs with YouTube URLs

Example Output:

```
Emotion Detected: Happy
Confidence: 95%

Recommended Songs:
1. Blinding Lights – The Weeknd
2. Get Lucky – Daft Punk
3. Happy – Pharrell Williams
```

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7. How to Run the Program

Option 1: Run in Google Colab

1. Open Colab
2. Upload your `.ipynb` file
3. Run all cells (`Runtime > Run All`)
4. Upload an image or use webcam

Option 2: Run through Gradio (optional UI)

- Simply run the Gradio block at the end
- A clean interface will appear
- Upload your image and get results instantly

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8. File Structure

```
Emotion-Music-Recommender/
│
├── main.ipynb                    → Main program file
├── music_mapping.py (optional) → Contains playlists
├── sample_images/                → Optional test images
├── README.md                     → GitHub summary
└── project_report.pdf            → PDF Report
```

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9. Summary

This implementation uses AI-based emotion recognition to recommend mood-appropriate music. The system is simple to use, runs smoothly on Google Colab, and produces clear outputs with high accuracy.