ARTIFICAL INTELLIGENCE AND MACHINE LEARNING (AIML) – PROJECT

sec-8

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Problem statement : Create a system for real-time emotion detection from facial expressions in video streams.

Capture and process video streams from various sources (e.g., cameras, smartphones, webcams) detect and track faces in the video stream. Extract facial features and analyze facial expressions. Classify emotions into predefined categories (e.g., happiness, sadness, anger, surprise, neutral) display real-time emotion detection results. Store emotion data for future analysis and insights.Robustness to varying lighting conditions, facial orientations, and occlusions user-friendly interface for configuration and monitoring Integration with existing video analytics platforms (optional).

Dataset:

Key Datasets for Emotion Detection:

1. CK+: 593 video sequences, 7 emotions.
2. RAF-DB: 29,672 images, diverse emotions.
3. EmotioNet: 950,000 images, 16 emotions.
4. JAFFE: 213 images,7 emotions, Japanese females.
5. SFEW: Movie frames, 7 emotions.
6. Oulu-CASIA: Video sequences, varying lighting.

7. FER-2013: 35,887 grayscale images, 7 emotions.
8. AffectNet: 1M+ images, basic and compound emotions.
9. KDEF: 4,900 images, multiple angles.
10. MS-Celeb-1M: Millions of celebrity images, useful for pre-training.

ALOGRITHM:

For Real-Time Emotion Detection from Facial Expressions:

1. Video Stream Capture:

- Capture video frames in real-time using a webcam or video feed.

2. Face Detection:

- Use a face detection algorithm (e.g., MTCNN, HOG + SVM, or OpenCV's Haar Cascades) to locate and crop the face region from each frame.

3. Facial Landmark Extraction:

- Apply facial landmark detection (e.g., Dlib) to identify key points on the face (eyes, nose, mouth, etc.).

4. Preprocessing:

- Normalize the facial region (resize, convert to grayscale if needed, etc.).

- Optionally, apply data augmentation techniques (e.g., slight rotations, lighting adjustments) to make the model more robust.

5. Emotion Classification:

- Feed the preprocessed facial data into a pre-trained

Convolutional Neural Network (CNN) model (e.g., VGGFace, ResNet) to classify the emotion (e.g., happy, sad, angry, surprised, etc.).

6. Post-Processing:

- Apply softmax to obtain probability scores for each emotion.
- Select the emotion with the highest probability as the detected emotion.

7. Real-Time Display:

- Overlay the detected emotion label on the video feed. Continuously update the video stream with the realtime emotion detection results

8. Optimization:

- Implement frame skipping or process every nth frame to reduce latency and ensure real-time performance.
- Use GPU acceleration (CUDA/cuDNN) for faster processing.

9. Deployment:

- Integrate the emotion detection system into an application (e.g., desktop, mobile, web).
- Ensure the system can handle different environments (lighting, angles) and is scalable

This algorithm provides a high-level overview of the steps involved in real-time emotion detection from facial expressions in video streams.

EXPECTED OUTPUT:

The expected output of this real-time emotion detection system is a live video feed from the webcam with the following features:

1. Face Detection:

The system should detect and highlight faces in the video stream by drawing rectangles around them in real-time.

2. Emotion Classification:

For each detected face, the system should predict the corresponding emotion (e.g., happiness, sadness, anger, fear, surprise, disgust, neutral).

The predicted emotion
label should be displayed on the video feed near the detected face

3. Real-Time Performance:

The system should process the video stream in real-time, meaning the detection and classification should occur with minimal delay, allowing for smooth and continuous feedback.

4. Interactive Display:

The video feed should show the live capture from the webcam with overlaid rectangles around faces and corresponding emotion labels, updating dynamically as the emotions change.

5. Robust Detection:

The system is expected to handle variations in lighting, face orientations, and expressions to provide consistent and accurate emotion detection.

By meeting these criteria, the system will deliver an engaging and functional tool for real-time emotion recognition from facial expressions.