



# **International Islamic University Chittagong**

## **Department of Computer Science & Engineering**

### **Project Report**

“EmotIQ”

Brainwave Emotion Recognition Team

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## **1.Introduction:**

EmotIQ is a deep learning-based emotion detection system that leverages computer vision to recognize and classify human emotions in real-time using a webcam. It utilizes a Convolutional Neural Network (CNN) trained on the FER2013 dataset to detect key facial expressions. Emotions such as 'Angry', 'Disgust', 'Fear', 'Happy', 'Sad', 'Surprise', 'Neutral' are accurately identified through facial landmarks and patterns.

The system is lightweight, user-friendly, and capable of running on standard hardware. Applications range from mental health tracking to smart surveillance and interactive assistants. By providing instant emotional feedback, EmotIQ enhances human-computer interaction. Its real-time response makes it ideal for live monitoring environments.

## **2. Objectives:**

- ❖ To detect and classify human emotions from facial expressions using image data.
- ❖ To build and train a CNN model for high-accuracy real-time emotion classification.
- ❖ To integrate OpenCV for live face detection and classification via webcam.
- ❖ To preprocess facial images effectively for consistent input to the model.
- ❖ To visualize and display detected emotions on-screen in real-time.
- ❖ To support multiple emotion classes including 'Angry', 'Disgust', 'Fear', 'Happy', 'Sad', 'Surprise', 'Surprise'
- ❖ To evaluate model performance using metrics like accuracy and loss on test data.
- ❖ To create a user-friendly interface for monitoring emotions without technical barriers.
- ❖ To test system responsiveness under different environmental conditions (lighting, distance).
- ❖ To explore use cases in mental health monitoring, customer service, and smart systems.

## **3. Software Requirements:**

- ☐ **Python 3.x** – Programming language
- ☐ **TensorFlow/Keras** – Deep learning framework
- ☐ **OpenCV** – Face detection and webcam integration
- ☐ **Pandas, NumPy** – Data preprocessing
- ☐ **Matplotlib** – Optional, for visualization
- ☐ **FER2013 Dataset** – Training data

## **4.Features :**

The EmotIQ system includes several cutting-edge features that enable real-time emotion detection using facial expressions. These features make it applicable in AI systems requiring emotional awareness and user engagement.

### **❖ Real-Time Emotion Detection**

The model uses the webcam feed to detect and classify human emotions on the fly. As soon as a face is detected, it processes the facial region and displays the corresponding emotion label.

### **❖ Deep Learning-Based CNN Model**

EmotIQ uses a Convolutional Neural Network (CNN) trained on the FER2013 dataset, a benchmark dataset for facial expression recognition. The model is built using Keras with TensorFlow backend, ensuring robust and accurate performance.

### **❖ Automatic Face Detection**

OpenCV's Haar Cascade classifier is used to detect faces in real-time. This ensures that only the relevant portion (Region of Interest - ROI) is fed to the emotion classifier.

### **❖ Five Emotion Categories**

The model classifies emotions into five key categories:

- 'Angry',
- 'Disgust',
- 'Fear',
- 'Happy',
- 'Sad',
- 'Surprise',
- 'Neutral'

These emotions are commonly used in affective computing and user mood analysis.

### **❖ Graphical Display:**

The system overlays bounding boxes on detected faces and displays the predicted emotion on the video feed, offering a clear and visual representation of the analysis.

### **❖ Fail-Safe Message Handling**

When no face is detected in the camera view, the application displays a "No Face Found" message instead of crashing or giving false predictions.

### **❖ User-Friendly and Lightweight**

EmotIQ runs directly from the terminal using `python test.py`, making it simple and accessible for testing or integration with larger systems.

## **5. Purpose:**

The primary purpose of the *EmotIQ – Brainwave Emotion Recognition* system is to create an interactive tool that can understand and respond to human emotional states using facial expressions. In today's digital world, emotion-aware systems are increasingly important across various domains:

### **❖ Human-Computer Interaction (HCI):**

Emotion detection enhances user experience by allowing machines to react appropriately to users' emotional states.

### **❖ Mental Health Monitoring:**

Real-time emotion tracking helps therapists and AI-driven mental health platforms monitor users for signs of depression, stress, or anxiety.

### **❖ Educational Environments:**

In e-learning, the tool can track student emotions like confusion or boredom, helping educators adjust their teaching strategies.

### **❖ Marketing and User Feedback:**

Understanding customer reactions while they interact with products or ads can help companies optimize their content and strategy.

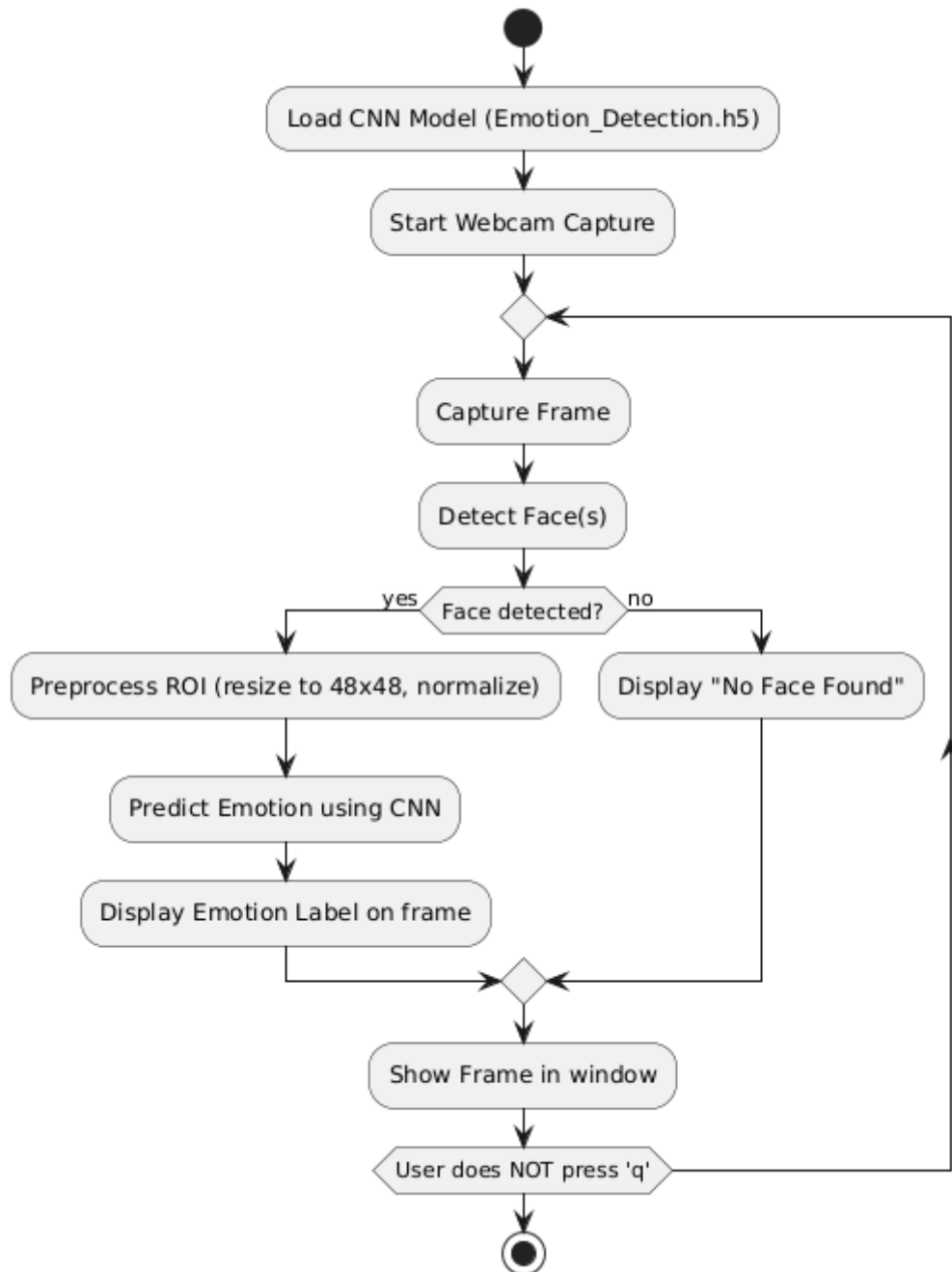
### **❖ Smart Surveillance Systems:**

Detecting anger or fear in public settings can trigger alerts in security systems to prevent conflicts or crimes.

### **❖ AI-Powered Chatbots and Assistants:**

By recognizing the user's mood, digital assistants can respond more naturally and empathetically.

## 6. Flow Chart:



## **7. Output:**

During execution (python test.py):

- ❖ The webcam window opens.
- ❖ The system detects faces in real-time.
- ❖ For each face detected, it displays a rectangle and the predicted emotion label.
- ❖ If no face is detected, it shows “No Face Found”.
- ❖ You can exit the application by pressing 'q' .

Example:

Detected: Happy 😊

Detected: Sad 😞

Detected: Surprise 😲

## **8. Conclusion:**

The EmotIQ project successfully implements a real-time facial emotion recognition system using CNNs and OpenCV. It classifies five basic emotions with considerable accuracy. With further improvements like data augmentation, facial landmarks, and more emotion classes, it can be integrated into advanced AI systems, providing machines with emotional intelligence.