International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 06 | June – 2025 DOI: 10.55041/ISJEM04087
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

MoodMapper: Facial Emotion Recognition

Roshan Gawande, Vibha Upadhya

PG Student, Department of MCA, Trinity Academy of Engineering Pune, India

Guide, Department of MCA, Trinity Academy of Engineering Pune, India

ABSTRACT

This paper presents 'Mood Mapper', a real-time facial emotion recognition system developed using deep learning techniques. It aims to detect and classify human emotions from facial expressions using a Convolutional Neural Network (CNN). The system is trained on FER-2013 dataset and supports emotion detection through image input or live webcam feed. Preprocessing steps like grayscale conversion, resizing, and normalization are applied for improved accuracy. The proposed system recognizes seven basic emotions and is implemented using Python, TensorFlow, Keras, and OpenCV. It demonstrates significant potential for real-world applications such as mental health monitoring, education, and customer engagement.

I. INTRODUCTION

Facial Emotion Recognition (FER) is a powerful technology that allows machines to understand and interpret human emotions by analyzing facial expressions. Just as we use smiles, frowns, and other facial cues to communicate how we feel, computers can now be trained to recognize these expressions using artificial intelligence.Our project, Mood Mapper, aims to make this possible through the use of Convolutional Neural Networks (CNNs), a type of deep learning model that mimics the way the human brain processes visual information. By feeding facial images or live video into the system, Mood Mapper can identify emotions such as happiness, sadness, anger, surprise, and more. This technology has many real-world applications. For instance, it can help monitor the emotional well- being of patients in healthcare, make online learning more responsive by detecting student engagement, or improve customer experience by understanding user satisfaction in service environments. With advancements like these, computers are moving one step closer to understanding us—not just logically, but emotionally too.

II. LITERATURE REVIEW

Facial Emotion Recognition (FER) is a growing field in artificial intelligence that enables machines to identify human emotions by analyzing facial expressions. Earlier systems used traditional machine learning methods like SVM and handcrafted features such as LBP and HOG, but these approaches struggled with accuracy in real-world conditions.With the rise of deep learning, especially Convolutional Neural Networks (CNNs), FER systems have become more accurate and reliable.

CNNs can automatically learn features from facial images, improving emotion classification across various conditions. Public datasets like FER-2013 have helped train these models effectively.However, many existing systems still face challenges like poor lighting, diverse facial structures, and high hardware requirements. Mood Mapper addresses these issues by offering a lightweight, real-time, and open source FER system using CNNs, designed to work efficiently with standard webcams and minimal resources.

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 06 | June – 2025 DOI: 10.55041/ISJEM04087
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

III. METHODOLOGY

The Mood Mapper system was developed using Python with TensorFlow, Keras, and OpenCV. It follows a modular pipeline:

1. **Data Collection:** The FER-2013 dataset was used, containing labeled facial expressions across seven emotions.
2. **Preprocessing:** Images were converted to grayscale, resized to 48x48 pixels, normalized, and augmented to improve accuracy.
3. **Model Building:** A CNN was designed with convolutional, pooling, dropout, and dense layers, ending with a softmax classifier.
4. **Training & Evaluation:** The model was trained using the Adam optimizer and evaluated using accuracy and confusion matrix.
5. **Real-Time Integration:** The model was integrated with OpenCV to detect and classify emotions from live webcam input.
6. **User Interface:** A basic GUI displays the live video with emotion labels and bounding boxes.

IV. DIAGRAM

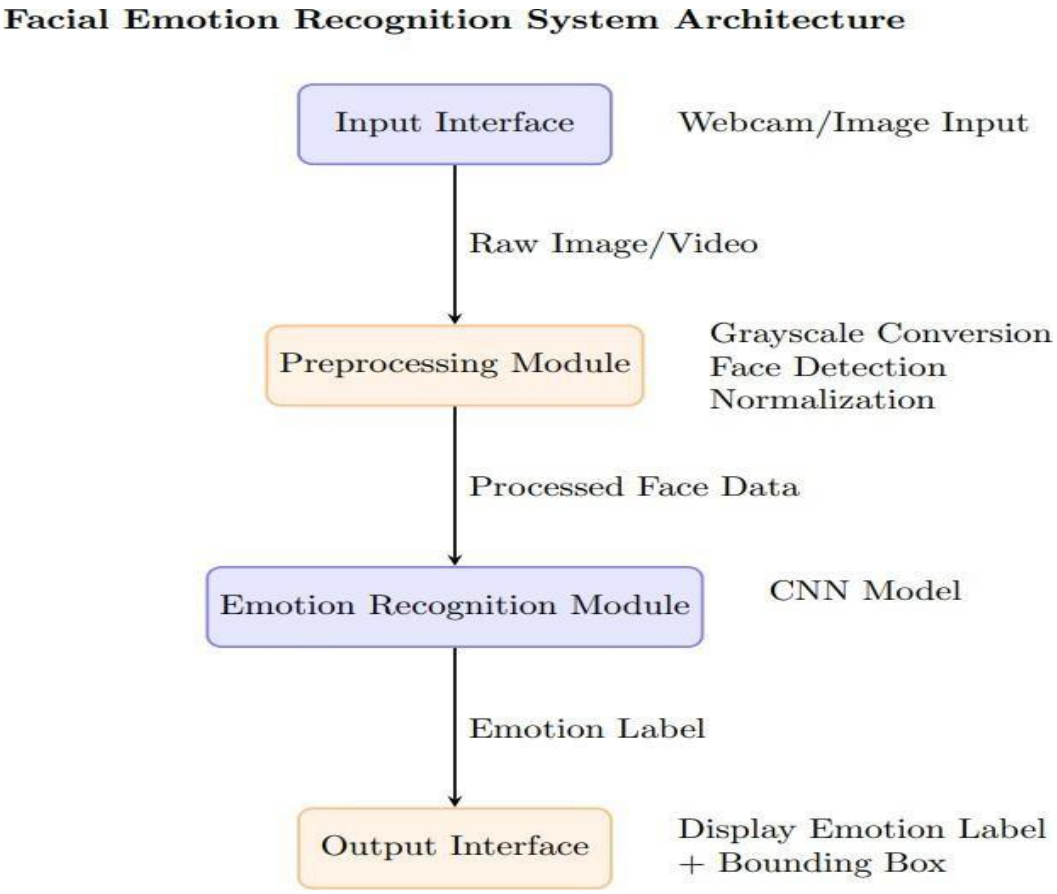

Fig. 1: Architecture of Facial Emotion Recognition

V. COMPONENTS USED

1. Hardware Components

a. Computer/Laptop: Used to run the Python application, train the model, and perform real-time inference.

b. Webcam (Built-in or External): Captures real-time facial expressions for emotion detection.

c. Monitor/Display: To view the GUI and real-time predictions.

d. GPU (Optional): Speeds up model training and improves real-time processing performance.

2. Software Components

e. Python Programming Language: Core language used for coding the entire system.

f. TensorFlow / Keras: Deep learning frameworks used for building and training the CNN model.

g. OpenCV: Used for image processing, face detection, and live webcam integration.

h. NumPy: Supports numerical operations and matrix manipulations.

i. Matplotlib (optional): For visualizing model performance (e.g., confusion matrix).

j. Tkinter / OpenCV GUI: For displaying the live feed and predicted emotion labels.

3. Development Environment

k. IDE (Integrated Development Environment): Visual Studio Code, Jupyter Notebook, or PyCharm used for writing and debugging code.

l. Operating System: Compatible with Windows 10+, Ubuntu/Linux, or macOS.

m. Dependencies/Tools: Anaconda (for managing Python environments

VI. CONCLUSION

The Facial Emotion Recognition project successfully demonstrates the capability of using computer vision and machine learning techniques to accurately identify human emotions from facial expressions. By leveraging image processing libraries and trained models, the system can detect and classify emotions in real-time or from static images with promising accuracy. This technology has practical applications in fields such as human-computer interaction, mental health monitoring, marketing analysis, and security systems. Further improvements can be made by expanding the dataset, enhancing model robustness, and integrating multimodal data for even more reliable emotion detection.

VII. REFERENCES

1. Goodfellow, Ian, et al. ”Challenges in representation learning: A report on three machine learning contests.” International Conference on Neural Information Processing. Springer, Berlin, Heidelberg, 2013.

2. LeCun, Yann, et al. ”Gradient-based learning applied to document recognition.” Proceed ings of the IEEE 86.11 (1998): 2278-2324.

3. Ekman, Paul, and Wallace V. Friesen. ”Constants across cultures in the face and emotion.” Journal of personality and social psychology 17.2 (1971): 124.