

# Human Emotion Detection through Real-Time Facial Expressions

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**Abstract:** Facial emotion detection is a key advancement in the field of artificial intelligence, enabling machines to interpret and respond to human emotions through visual analysis. This project presents a real-time system for recognizing facial expressions using deep learning techniques, with practical applications in healthcare, education, and human-computer interaction. The model is built by integrating two powerful pre-trained networks—EfficientNet-B3 and ResNet-50—for accurate and efficient emotion classification. The RAF-DB dataset, comprising over 15,000 real-world facial images labelled with seven basic emotions, is used for training and evaluation. The proposed system incorporates essential preprocessing techniques, including face detection, alignment, normalization, and data augmentation, to enhance performance. It achieves a training accuracy of 90% and a testing accuracy of 83.35%, demonstrating strong generalization. The system is designed for real-time performance with webcam input and OpenCV integration. This approach highlights the potential of deep learning in developing intelligent systems capable of understanding and responding to human emotional states.

**Keywords:** Real-time emotion detection, Facial expressions, Deep learning, Feature selection, Multi-class classification

