

Performance Evaluation of Deep Learning Approaches for Emotion Recognition under Varying Visual Conditions

Ansith S

Department of ECE, Toc H Institute of Information Technology, Ernakulam, Kerala

Kavya Raj

Department of ECE, IIIT Kottayam, Kerala

Abstract:

— Facial expression recognition plays a crucial role in enabling emotion-aware computing for applications in healthcare, human-computer interaction, and behavioural analysis. Achieving accurate recognition under diverse imaging conditions remains challenging due to variations in illumination, pose, and expression intensity. To address these issues, an efficient comparative framework is presented using two deep learning architectures with distinct design philosophies: EfficientNet-B0, a compact convolutional model optimised for balanced performance and efficiency, and Swin-Tiny, a transformer-based architecture capable of modelling long-range dependencies through hierarchical attention. Both models are trained and evaluated on FER-2013 and CK+ datasets to examine their effectiveness in recognising seven universal emotions. The experimental evaluation reveals that while EfficientNet-B0 maintains strong accuracy with low computational overhead, Swin-Tiny achieves higher balanced accuracy, macro-F1, and AUC, demonstrating superior feature extraction and generalisation capability. The findings highlight the potential of transformer-based models for robust emotion recognition while reaffirming the efficiency advantages of compact convolutional networks in real-time environments.

Keywords:

Facial expression recognition, deep learning, emotion classification, image classification.