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Facial Expression Detection through Biometric Indicators: an Applied Model for Emotion Classification and Educational Contexts

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Abstract

Facial emotion recognition has become a central topic in applied social sciences, psychology and educational technology, offering new opportunities for understanding human behavior in digital environments. This study proposes a biometric model for classifying six basic emotions—happiness, sadness, fear, anger, surprise and disgust—using twelve standardized facial indicators extracted through computer vision analysis. Quantitative features such as brow height, eyelid aperture, cheek activation, jaw movement and lip corner displacement were numerically encoded and mapped to emotional categories based on validated datasets (CK+ and JAFFE). Using supervised machine-learning methods (Support Vector Machine and Random Forest), the model achieved an average accuracy of 87.5%, with high precision for happiness and surprise and greater ambiguity between fear–surprise and disgust–anger due to overlapping morphological patterns. Beyond its computational contribution, the study highlights the relevance of facial emotion detection for social sciences and education: monitoring learners' affective states, identifying confusion or frustration, supporting adaptive feedback, and enhancing emotional responsiveness in digital learning systems. The proposed model offers an interpretable, low-cost and scalable approach to emotion detection, with implications for psychology, educational sciences, human–computer interaction and social behavioral research.

Keywords: Affective Computing, Biometric Indicators, Emotion Recognition, Educational Technology, Facial Expressions