

Comparative Analysis of Facial Expression Recognition Methods

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Abstract

This paper aimed to investigate human emotion recognition through the analysis of facial expressions, using both classical machine learning methods and advanced techniques based on deep neural networks. The research compares the performance of classical machine learning algorithms (such as K-Nearest Neighbors, Gaussian Naive Bayes, Support Vector Machines, Adaptive Boosting, Decision Tree, and Random Forest) with the modern deep learning methods (such as Convolutional Neural Networks, Deep Neural Networks, and Recursive Neural Networks) using standardized datasets. The main steps include image preprocessing, noise reduction from the data by removing the background, and extracting essential features for the classification of basic emotions according to Paul Ekman's model, which defines the set of universal emotions (happiness, anger, surprise, sadness, disgust, fear). Performance evaluation is based on metrics such as accuracy, precision, and F1 score, using validation methods like hold-out and K-fold cross-validation. Emotion recognition through facial expression analysis holds significant importance in various fields, including the medical domain, where it is used for the early detection of affective disorders, monitoring the emotional state of patients, and improving human-machine interaction in Artificial Intelligence-assisted therapies. The integration of such solutions can contribute to the development of decision support systems in psychiatry, optimizing therapeutic strategies, and improving the quality of care for patients with neuropsychological conditions. The research not only deepens the understanding of emotion classification algorithms but also provides valuable perspectives for their application in crucial areas such as mental health and personalized medical assistance.

Keywords: Emotion Recognition; Facial Expression Analysis; Machine Learning; Deep Learning Mental Health.

