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Initial Study on Machine Learning for EEG-Based Emotion Recognition

Abstract

Affective computing aims to design computational systems capable of recognizing and responding to human emotions. Among the various physiological signals used for this purpose, electroencephalography (EEG) provides a non-invasive and sensitive modality, capturing neural oscillations directly linked to affective states. Unlike behavioural or facial cues, EEG signals reflect genuine neurophysiological responses, enabling more objective emotion decoding. Recent advances in artificial intelligence, particularly machine learning (ML) and deep learning (DL), have significantly improved the robustness and accuracy of EEG-based emotion recognition. Modern approaches leverage convolutional, recurrent, and graph-based neural networks, as well as hybrid architectures, to extract complex spatio-temporal features from noisy, high-dimensional data. Furthermore, multimodal learning strategies, which combine EEG with complementary biosignals, enhance system reliability in real world scenarios. Despite substantial progress, challenges remain regarding data variability, interpretability, and generalization between individuals and environments. Addressing these issues requires explainable models, standardized datasets, and adaptive algorithms. EEG-driven emotion recognition holds promise for applications in mental health, human-computer interaction, and personalized technologies, marking an essential step toward intelligent, emotion-aware systems. This study is of an initial work character.