



Approaches, Applications, and Challenges in Physiological Emotion Recognition—A Tutorial Overview

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ABSTRACT | An automatic emotion recognition system can serve as a fundamental framework for various applications in daily life from monitoring emotional well-being to improving the quality of life through better emotion regulation. Understanding the process of emotion manifestation becomes crucial for building emotion recognition systems. An emotional experience results in changes not only in interpersonal behavior but also in physiological responses. Physiological signals are one of the most reliable means for recognizing emotions since individuals cannot consciously manipulate them for a long duration. These signals can be captured by medical-grade wearable devices, as well as commercial smart watches and smart bands. With the shift in research direction from laboratory to unrestricted daily life, commercial devices have been employed ubiquitously. However, this shift has introduced several challenges, such as low data quality, dependency on subjective self-reports, unlimited movement-related changes, and artifacts in physiological signals. This tutorial provides an overview of practical aspects of emotion

recognition, such as experiment design, properties of different physiological modalities, existing datasets, suitable machine learning algorithms for physiological data, and several applications. It aims to provide the necessary psychological and physiological backgrounds through various emotion theories and the physiological manifestation of emotions, thereby laying a foundation for emotion recognition. Finally, the tutorial discusses open research directions and possible solutions.

KEYWORDS | Affective computing; deep learning; emotion recognition; physiological signals; wearable.

1. INTRODUCTION

Emotions serve a significant role in human lives as they assist in decision-making and forging social relationships. The short-lasting emotional responses distinguish themselves from affective states, such as mood or stress. However, enduring negative emotions may have severe effects if they are not managed well early. They may inhibit learning among students [1], lead to burnout among workers [2], and eventually lead to mental health disorders, such as anxiety- and mood-related disorders, schizophrenia, and substance abuse [3].

Automatic recognition of emotions (specifically negative emotions, such as sadness, anxiety, fatigue, and anger) can contribute significantly to a prescreening tool to prevent adverse health consequences. Suppose that one is driving a car for a long distance under time pressure and

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Approaches To Emotion

JA Banks



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