Chapter 2
Machine Learning Techniques for Emotion Detection Using Eye Gaze Localisation

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ABSTRACT

The ability to detect and interpret human emotions is vital for effective communication. This chapter explores the integration of machine learning with eye gaze localization for emotion detection, offering a non-intrusive and natural means of expression. Eye gaze data, encompassing parameters like gaze direction and pupil dilation, provides a rich basis for machine learning models. The chapter emphasizes the significance of quality training data, delving into data collection, pre-processing, and feature extraction. Various machine learning models, including support vector machines and deep learning models like CNNs and RNNs, are discussed for emotion detection. Evaluation metrics and cross-validation techniques ensure model accuracy. Practical applications in healthcare, marketing, and human-computer interaction are presented, showcasing the benefits. Despite successes, challenges like data bias and privacy concerns persist. The chapter encourages ongoing exploration of emerging technologies and sensory data integration for more robust models in the evolving field of emotion detection using eye gaze localization.

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INTRODUCTION

Emotions in Communication and Interaction

Emotions, despite being so personal, are a big part of how an individual connects with other people. They are a mirror of one's inner self and a catalyst for other people's responses (Trampe et al., 2015). Emotions appear as responses to processed stimuli in the physiological, behavioral, and communicative domains. These responses could be mild physiological adjustments or major behavioral changes that either directly convey the inner state or only draw attention to it (Brosch et al., 2010). Emotions can influence social interactions through both voluntary and involuntary cues such as facial expressions, body language like fidgeting, tone of voice, or physiological changes like increased heart rate, sweaty palms or more. These indications can be voluntary, like when we intentionally smile to convey happiness or hold back tears in a difficult situation. Conversely, they can also be involuntary, such as blushing when embarrassed or flinching when startled (Approaches_To_Emotion, n.d.; van Kleef et al., 2016). These emotional signals often communicate our internal state to others, shaping how they perceive and respond to us in social interactions.

Primary emotions are defined as intrinsic, fleeting, and globally identifiable, while secondary emotions are more intricate, multifaceted, and culturally and individually varied (Šimić et al., 2021). An individual's socialization and upbringing have an impact on how it expresses and understands emotions. According to attachment theory, one's early interactions with caregivers influence their emotional inclinations later on and determine their attachment types and emotional landscape (Abrams et al., 2013). Through display rules that specify who can exhibit what emotions and how, cultural norms also have a significant impact on how people express their emotions. While some cultures encourage distinct emotional displays or limit emotional expression based on social context or gender, western societies tend to place more emphasis on positive emotions (Hareli et al., 2015).

Verbal or nonverbal communication about emotions strengthens relationships between people and offers comfort (Eaves & Leathers, 2017). The spread of emotions among people, or emotional contagion, emphasizes how contagious emotions are. Gaining a vocabulary of emotions facilitates the expressing of emotions more clearly, which promotes efficient communication. By helping one recognize and control our emotions as well as react correctly to the emotional clues of others, emotional intelligence promotes empathy and fortifies social bonds. Emotions are fundamental to human connection and ultimately influence our views, actions, and interpersonal interactions, making it critical to comprehend, control, and deal with them.