PersonaGAN: A Health-Aware Conditional Stacked GAN for Emotion-Aware Avatar Generation from Wearable Physiological Signals

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Abstract

Over the past few years, wearable devices like smartwatches have become central to the seamless tracking of physiological signals that reveal a person's emotional and physical state. Although earlier research has shown that it is possible to identify stress and emotional states from this kind of data, the results are usually simplified to abstract measures like class labels, confidence scores, or statistical plots that have very little interpretability or value for the end users' experience. Besides, many emotion detection tools rely on externally visible features, especially facial expressions, which may not accurately represent the real emotional states if the expressions are being regulated either deliberately or unintentionally. Conversely, emotional states inferred from physiological signals are more accurate representations of the true affect, however, this area has not been sufficiently explored in terms of intuitive and human-centered interactive visualization. Here is where PersonaGAN comes in, a conditional stacked adversarial framework that converts physiological signals obtained from wristbands into expressive visual avatars. Hand data from the WESAD dataset are first processed, then normalized and encoded into emotion-aware conditioning vectors that depict internal affective responses without depending on facial cues. The proposed framework is a two-stage conditional stacked generative adversarial architecture with perceptual refinement that helps in semantically coherent and visually realistic avatar generation.

Keywords

Affective Computing, Avatar Generation, Generative Adversarial Networks, Physiological Signals.