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A Convolutional Neural Network Approach to Real-Time Emotion Recognition from Voice and Facial Expressions

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Abstract

Emotion recognition plays a crucial role in human-computer interaction, with applications spanning healthcare, smart environments, customer service, and affective computing. This paper presents the design and implementation of a web-based application capable of detecting human emotions from both facial images and voice signals. The system employs deep learning techniques, specifically Convolutional Neural Networks (CNNs), to classify seven fundamental emotions: happiness, sadness, anger, fear, surprise, disgust, and neutral. For training and evaluation, we used grayscale facial image datasets and the Ryerson AudioVisual Database of Emotional Speech and Song (RAVDESS) for audio data. Feature extraction from audio inputs was performed using spectrogram transformations and melfrequency cepstral coefficients (MFCCs). The application is developed using Python and Django, and it integrates machine learning libraries such as TensorFlow, Librosa, and scikitlearn. The user interface allows for real-time emotion classification from uploaded files or live recordings. Experimental results demonstrate the system's effectiveness in recognizing emotional states under controlled conditions. This work highlights the potential of AI-driven emotion recognition systems for future use in smart and adaptive technologies.

Keywords: Emotion Recognition, Convolutional Neural Networks (CNN), Artificial Intelligence (AI), Facial Expression, Vocal Analysis, Web-Based Application