Research on Convolutional Neural Networks and their application to the problem of recognizing student emotions during class

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Abstract: This study investigates the application of Convolutional Neural Networks (CNNs) for real-time emotion recognition of students in classroom settings. Leveraging the hierarchical feature extraction capabilities of CNNs, a deep learning model was developed and trained on a dataset of facial expressions captured under varied classroom lighting and occlusion conditions. The model architecture was optimized to balance computational efficiency with high classification accuracy for key emotional states, including engagement, confusion, boredom, and frustration. Experimental results demonstrate that the proposed CNN achieves a recognition accuracy of over 92%, significantly outperforming traditional machine learning methods. Furthermore, the system's ability to process video streams in real-time enables non-intrusive monitoring of student affective states, providing valuable feedback for adaptive teaching strategies. The findings underscore the potential of CNNs as a robust tool for educational analytics, offering a pathway toward more responsive and student-centered learning environments.

Keywords: Convolutional Neural Networks, Emotion Recognition, Student Emotion, Classroom Learning