Journal of Contemporary Educational Research, 2026, Volume 10, Issue 3
http://ojs.bbwpublisher.com/index.php/JCER
ISSN Online: 2208-8474
ISSN Print: 2208-8466

Application of Xinghuo Large Model in Teachers' Facial Emotion Analysis

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Abstract: Facial expression recognition has been an active research field over the past few decades, with typical methods including principal component analysis based on eigenfaces and independent component analysis. With the development of deep learning technology, convolutional neural networks have also played an important role in facial expression recognition. Although these methods perform well, there is still significant room for improvement. This paper uses the Xinghuo Large Model for teachers' facial emotion analysis. First, classroom recorded videos are framed to extract key facial expression regions of teachers; then a network model is constructed, which is adjusted and extracted through a two-stream architecture; next, teachers' facial data are used as network input, and emotion prediction is performed using deep learning-based methods and Xinghuo Large Model-based methods respectively; finally, the prediction results are fused to obtain the final teachers' facial emotion analysis results.

Keywords: Xinghuo Large Model; Facial emotion analysis; Deep learning

Online publication: April 7, 2026

1. Introduction

As one of the most disruptive technologies in the 21st century, artificial intelligence is a discipline about knowledge, which has been widely applied in various fields—from smart homes to autonomous driving technology, from medical and health care to intelligent learning, artificial intelligence can be seen everywhere in life [1]. Education, as an important cornerstone of human social development, its quality improvement is of great significance to national and social development. In the modern education process, teachers' emotional states not only have a great impact on students' learning mentality but also affect their own teaching methods. Therefore, the recognition and analysis of teachers' facial emotions have become a focus of attention in the field of education. Facial emotion analysis is a method that automatically analyzes and recognizes human facial expressions through computer vision and pattern recognition technologies [2]. In recent years, with the development of deep learning technology, neural network-based facial emotion analysis methods have achieved remarkable progress. Among them, iFlytek Xinghuo Cognitive Large Model, as a new generation of cognitive intelligent large model, not only possesses cross-domain knowledge and language understanding capabilities

but also can understand and execute tasks based on natural dialogue. It has achieved excellent performance in fields such as image generation and style transfer.

2. Related work

Xu *et al.* proposed an emotion-sensitive learning cognitive state analysis framework, which automatically estimates the object's attention points based on head posture and the object's emotions based on facial expressions [3]. Singh *et al.* proposed a multi-modal framework to analyze the object's emotions, especially for the object's negative emotions, using images, speech, and text for analysis [4]. Miskowiak studied facial emotion analysis systems using convolutional neural networks and proposed a deep learning-based facial emotion recognition system for human groups. This system performs worse in recognizing emotions in image sets than in recognizing real human expressions [5]. Kaviya *et al.* discussed the diversity of age effects generated by the design of different facial emotion recognition tasks and their impact on understanding real-world defects and task selection in future emotion recognition research [6]. Li *et al.* introduced a new dataset for drivers' spontaneous emotion analysis by studying the Driver Emotion Facial Expression (DEFE) dataset of intelligent vehicles: emotions triggered by video and audio in driving scenarios [7]. Holland *et al.* conducted a comprehensive analysis of the correlation between facial mimicry and empathy and facial emotion recognition skills [8]. Lai [9] aimed at the "emotional deficit" problem in online learning, and realized real-time feedback of students' emotions in online learning by using facial expression recognition to perceive students' emotions. This can help teachers timely understand students' learning status, adjust teaching methods, and then improve online teaching efficiency. Shi [10] first analyzed the variation rules of feature point positions based on dynamic image sequences under different emotions, designed a facial expression recognition algorithm based on the active shape model based on these rules, and on this basis, considered factors such as unbalanced lighting environment, and studied an improved scale-invariant feature transform method for facial expression recognition. This paper aims to explore the application of the Xinghuo Large Model in teachers' facial emotion analysis and its potential in this field. The performance of the Xinghuo Large Model in teachers' facial emotion analysis is verified through experiments, and future research directions are prospected.

3. Proposed method

This paper proposes to apply the Xinghuo Large Model to the task of teachers' facial emotion analysis, as shown in **Figure 1**. First, we frame classroom recorded videos, extract key facial expression regions of teachers, and construct a smart classroom teacher facial expression dataset; then, a network model is constructed, which is adjusted and extracted through a two-stream architecture; next, teachers' facial data are used as network input, and emotion prediction is performed using deep learning-based methods and large model-based methods respectively; finally, the prediction results are fused to obtain the final teachers' facial emotion analysis results.

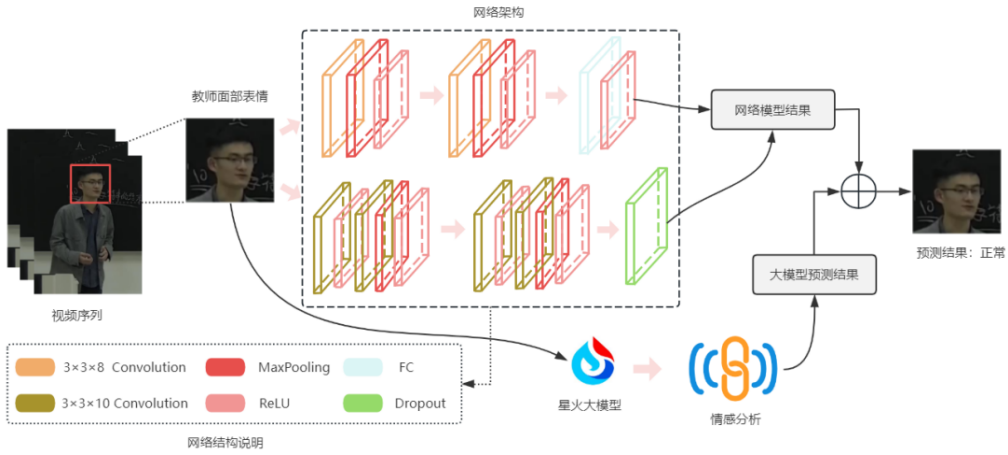

Figure 1. Basic framework of the proposed method

4. Experimental results

In this section, a detailed experimental analysis of our model is conducted on three facial expression recognition databases. We first briefly overview the databases used in this work, then provide the performance of our model on the three databases, and compare the results with some advanced works.

4.1. Dataset introduction

Currently, several popular facial expression recognition datasets mainly include FER2013 [11], CK+ [12], and FERG [13]. Before conducting the research, a brief overview of these datasets is given. The FER dataset contains 35,887 images with a resolution of 48×48, most of which are taken in wild environments. Initially, the training set contains 28,709 images, and the validation and test sets each contain 3,589 images. Compared with other datasets, FER has more variations in images, including facial occlusions (mainly with hands), partial faces, low-contrast images, etc. **Table 1** shows the classification accuracy of the FER2013 dataset. The CK+ facial expression database is a public dataset for action unit and emotion recognition, which includes posed and non-posed expressions. CK+ includes 593 sequences of 123 subjects. In most previous works, the last frame of these sequences is extracted and used for facial expression-based recognition. **Table 2** shows the classification accuracy of the CK+ dataset. FERG is a stylized character database with annotated facial expressions. This database contains 55,767 annotated facial images. The characters are modeled using MAYA, and the images of each character are grouped into seven types of expressions. **Table 3** shows the classification accuracy of the FERG dataset.

Table 1. Classification accuracy on FER2013 dataset

Method	Accuracy (%)
Bag of Words	67.4
VGG_SVM	66.3
GoogleNet	65.2
Mollahosseini	66.4
Proposed Method	68.8

Table 2. Classification accuracy on CK+ dataset

Method	Accuracy (%)
MSR	91.4
3DCNN_DAP	92.4
Inception	93.2
IB_CNN	95.1
IACNN	95.4
DTAGN	97.2
ST_RNN	97.2
PPDN	97.3
Proposed Method	97.4

Table 3. Classification accuracy on FERG dataset

Method	Accuracy (%)
DeepExpr	89.0
Multi_feature	97.1
Adversarial	98.2
Proposed Method	99.1

4.2. Experimental analysis and comparison

On public datasets, the emotional labels in this paper include six categories: Fear, Disgust, Sadness, Anger, Happiness, and Surprise. For the teacher emotion dataset, due to the small amount of data, the labels in this paper include three categories: Positive, Negative, and Normal. For the prediction results given by the model, further classification is made in this paper: Positive expressions include Happiness and Surprise; Negative expressions include Fear, Disgust, and Sadness; Normal expressions are Neutral. The experimental results are shown in **Figure 2**. The first photo is predicted as Neutral by the model and Normal by Xinghuo, with the final result being Normal; the second photo is predicted as Happy by the model and Positive by Xinghuo, with the final result being Positive; the third photo is predicted as Happy by the model and Normal by Xinghuo, with the final result being Positive.

Figure 2. Experimental results

5. Conclusion

By analyzing teachers' facial emotions, the Xinghuo Large Model can help teachers timely understand their own emotional states, so that teachers can adjust their mentality to improve teaching quality, and also provide decision support for school managers. However, it should be noted that facial emotion analysis is only an auxiliary tool, and its prediction results are not necessarily correct and cannot completely replace human observation and judgment. Therefore, when using the Xinghuo Large Model for facial emotion analysis, we also need to combine other information, such as teachers' teaching methods and students' learning status, to obtain more accurate results.

Funding

This work was supported by the Software and System Engineering Research Center of Smart Car, Anhui Institute of Information Technology (AIIT) (No.: 23kjcxpt001).

Disclosure statement

The authors declare no conflict of interest.

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