

ABSTRACT

Facial expression based emotion recognition systems can enhance interaction between humans and computers. However, implementing such systems in real-time still faces challenges in terms of speed and consistency. In this study, the system receives facial image from a camera and produces emotion labels as output. This topic is important due to its wide range of applications including customer service, education, and mental health. Existing systems are generally limited to static image processing and often fail to deliver stable results under real-world conditions. This research develops a custom designed CNN model for emotion classification and integrates the YOLO algorithm for face detection. The FER-2013 dataset is used as the sole training data. To improve performance, several processes were applied including normalization, data augmentation, class balancing using SMOTE, and hyperparameter optimization. The system was tested under various scenarios including direct testing using a laptop camera. The resulting model achieved an accuracy of 68.8% and was able to operate stably in real-time conditions. The system demonstrated fast performance and successfully detected and recognized facial emotion in a variety of test situations.

Keywords: *emotion recognition, facial expression, CNN, YOLO, real-time, FER-2013*