Chapter 6
Efficient Facial Expression Recognition Using Deep Learning Techniques

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ABSTRACT

Facial expression recognition (FER) is an important topic in the field of computer vision and artificial intelligence due to its potential in academic and business. The authors implement deep-learning-based FER approaches that use deep networks to allow end-to-end learning. It focuses on developing a cutting-edge hybrid deep-learning approach that combines a convolutional neural network (CNN) for the prediction and a convolutional neural network (CNN) for the classification. This chapter proposes a new methodology to analyze and implement a model to predict facial expression from a sequence of images. Considering the linguistic and psychological contemplations, an intermediary symbolic illustration is developed. Using a large set of image sequences recognition of six facial expressions is demonstrated. This analysis can fill in as a manual to novices in the field of FER, giving essential information and an overall comprehension of the most recent best in class contemplates, just as to experienced analysts searching for beneficial bearings for future work.

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I. INTRODUCTION

Recognizing the facial expression plays a significant role in human sentiment acknowledgement, which is comprehensively utilized in interaction of human and computer, image understanding, recognition of pattern, machine vision and various fields.

It is easy to understand the mood of a person by his facial expressions. A human being may belong to any culture but his facial expressions remains the same based on his feelings like happiness, fear, sadness, surprise, anger and disguise. The combination of convolutional neural networks, deep learning theory and artificial neural networks as a new approach for facial recognition has made remarkable growth in classification of images. This methodology utilizes weight sharing, receptive field and pooling software and significantly reduces the specifications required for training compared to neural network. It shows certain invariance in object translation, rotation and distortion diploma.

TensorFlow (open-source software library released by google in the year 2015 to make it simple for the researchers and developers to develop and train machine learning models) is developed for the research and development of artificial intelligence in accordance with the Google. It has guide for CNN, RNN and other useful applications in artificial neural network model. Keras is an open-source library in python with a neural-network library successful of jogging on pinnacle of TensorFlow. It is user-friendly designed for quick experimentation with deep neural networks, modular and extensible. This paper implements an advantageous facial expression model that can be trained on systems with less specifications in restricted amount of time therefore allowing to train the model with a good accuracy by the use of our dataset.

Earlier, analysis of facial expression was essentially a research area for psychologists. However, recent advances in image processing and pattern recognition have inspired researchers to work on automatic facial expression recognition. In old days, a lot of time and effort was dedicated for the recognition of facial expression in motionless pictures, due to this, various techniques have been applied like neural networks, Gabor wavelets and active appearance models. The fact that static images typically capture the peak of the expression, i.e., the moment at which the indicators of feeling are generally tested, is a major limitation of this technique. People rarely display the peak of their facial expression during ordinary contact with their partners in their daily lives, unless in very particular cases and for very short periods of time.

The main objective of the work is to come up with a solution for the problem faced in facial expression recognition by dividing it into sub-parts and classifying them under some specific Action Units. The complexity of the work includes not only two class issues that indicate whether an Action Unit is on or off, but also multi-class