Chapter 5
Deep Learning for Emotion Recognition

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ABSTRACT

Deep learning is a type of machine learning that trains a computer to recognizing speech, identifying images or making predictions. Computer vision allows machines to visualize and sense the visual world from digital images or videos. Computer vision can be used for face detection, recognition, and emotion detection. There is a growing demand for emotion analysis in the computer vision market. Expressions play an important role in the recognition of emotions for medical sentiment analysis that can be detected by a deep learning model with the help of trained classes. This chapter focuses on emotion recognition and discusses the different algorithms/architecture developed for emotion recognition using deep learning with the data set. Current research and applications based on emotion recognition are also discussed. This chapter can guide beginners in the field of emotion recognition and provide a general understanding of the latest state of art models, as well as guide the researchers looking for directions for future work.

INTRODUCTION

Facial expressions are a simple way for humans to tell how another person is feeling, but machines find it incredibly difficult to do the same. Partial occlusion and fake emotion expression are some of the challenging issues in emotion recognition. Effective Deep Learning (DL) algorithms in deeper network architectures can mitigate these issues by training, self-adapting and learning the emotional features to recognize the feelings accurately with respect to applications. One can make use of deep learning

algorithms to train the computer to understand human emotions. DL is a sort of machine learning that teaches a computer to execute activities similar to those performed by humans. DL is considered as an important topic within the area of machine learning, due to its learning capabilities from the given data. DL has given a great way to crack a variety of computer-vision problems such as image recognition, tracking of an object, human action recognition, emotion recognition, identifying images, and prediction of results. This chapter will examine the main advancements in deep learning algorithms and architecture for emotion detection using sentimental analysis. Emotion recognition allows the machine to understand human feelings through multimedia contents such as images, videos, texts, speech, gestures, and physiological signals.

In this context, DL models like Convolutional Neural Networks(CNNs), Deep Belief Networks(DBNs), Deep Boltzmann Machines(DBMs), and stacked(denoising) autoencoders, Long Short-Term Memory(LSTM), in the category of Recurrent Neural Networks(RNN), is applied in emotion analysis in combination or as stand-alone based on the domain area of application. The advantage of using DL is that it requires less amount of human effort and field knowledge compared to predecessors. Feature extraction is an important topic in emotion analysis. For feature extraction, several layers of nonlinear processing are used by DL algorithms. While lower layers learn basic features from the data input and higher layers derive more advanced features from lower-layers.

Humans will express his emotions through face, gesture, speech, and text that will impact the physiological signals in the human body. Computers now have the ability to understand human emotions and act in accordance with those feelings, which has made the research of Face Emotion Recognition (FER) particularly intriguing. Human-computer interaction, entertainment, and the field of medicine can all benefit from physiological pattern identification of emotion. Stress, rage, and other emotions that have an impact on health can be recognised by physiological pattern recognition. Textual Emotion recognition has become a trend in recent years. Nowadays, everyone started using Twitter for posting their opinions regarding a topic about a movie, product, and politics etc. So it is very important to understand the emotions of a text message on any social media. As human-machine interaction is going to be on its next level with the help of deep learning, machines need to understand what emotion people have conveyed through their speech. Since emotions improve our ability to understand one another, it makes sense to apply this understanding to machines as well. Speech recognition is already a part of daily life; for example, smart mobile devices may accept voice instructions and respond to them with synthesised speech. Robots and human-computer interaction (Abeer et al., 2022) could both benefit from the usage of speech emotion recognition (SER), which would allow computers to recognise human emotions (Schuller, 2018). (Huahu et. al., 2010).

With the development of technologies, there has been an increase in demand for sentiment analysis in a variety of applications, from opinion mining (getting an idea about opinions, and attitudes of humans regarding a topic), medical field, online classes, tourism-based feedback, monitoring of social media, product review, service review. Emotion recognition is critical for human interactions (Cowie et. al., 2001), entertainment (Cosentino et. al.,2018), education, safe driving, and multimedia integration, as well as sentiment analysis, social media monitoring and forecasting, smarter decision aid, dynamic quality adaption to game players, depression recognition (Yang et. al.,2019), and medical rehabilitation for children with autism spectrum disorders.

Emotion Model in DL: Fatemeh et. al., (2021) classified emotion model into three types as follows: In categorical model,emotions are grouped into a collection of discrete classes, such as happiness, sorrow, fear, rage, disgust, and surprise (Figure 1a). In dimensional models, emotions are grouped into

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