


# Chapter 6

## Image Classification Using Deep Neural Networks: Emotion Detection Using Facial Images

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### ABSTRACT

*Facial expression recognition is an activity that is performed by every human in their day-to-day lives. Each one of us analyses the expressions of the individuals we interact with to understand how people interact and respond with us. The malicious intentions of a thief or a person to be interviewed can be recognized with the help of his facial features and gestures. Face recognition from picture or video is a well-known point in biometrics inquiry. Numerous open places, for the most part, have reconnaissance cameras, and these cameras have their noteworthy security incentives. It is generally recognized that face recognition has assumed a significant job in reconnaissance framework. The genuine favorable circumstances of face-based distinguishing proof over different biometrics are uniqueness. Since the human face is a unique item having a high level of inconstancy in its appearance, face location is a troublesome issue in computer vision. This chapter explores emotion detection using facial images.*

### INTRODUCTION

Emotions enable a form of communication among human beings. Complex social communication come into context with the understanding of Emotion. Emotion Detection can be done via voice, body gestures and other complex methods. There are many practical methods to examine facial emotions too. There are seven types of human emotions that are universally recognized. The seven we are talking about includes happiness, sadness, fear, surprised, anger, disgust and neutral. A service that detects emotion from facial

DOI: 10.4018/978-1-7998-7188-0.ch006

emotions would be widely applicable, as such a service can bring advancement in various applications of gaming, marketing, consumer product satisfaction and entertainment. Emotion Detection has attracted significant attention in the advancement of human behavior and machine learning. Various applications related to face and emotion detection include: Personal Credentials and Access Control, Video Phone and Tele conferencing, Medical and Forensic Applications, Gaming and Applications, analyzing human behavior to ascertain work satisfaction (Franco & Treves, 2001).

Face recognition is a method of identifying or verifying the identity of an individual using their face. There are various algorithms that can do face recognition but their accuracy might vary. Here I am going to describe how we do face recognition using deep learning. In computer vision, one essential problem we are trying to figure out is to automatically detect objects in an image without human intervention. Face detection can be thought of as such a problem where we detect human faces in an image. There may be slight differences in the faces of humans but overall, it is safe to say that there are certain features that are associated with all the human faces. There are various face detection algorithms but Viola-Jones Algorithm is one of the oldest methods that is also used today. Face detection is usually the first step towards many face-related technologies, such as face recognition or verification. However, face detection can have very useful applications. The most successful application of face detection would probably be photo taking. When you take a photo of your friends, the face detection algorithm built into your digital camera detects where the faces are and adjusts the focus accordingly.

There are four categories of methods that are used to detect human face, namely: Feature Method: Based on facial features like placement of eyes, nose, contour; Knowledge Method: Pre-Trained Models as we instill our model with datasets; Appearance Method: Based on Neural Networks approach; Template Method: Checks for the correlation between standard image and input image face pattern. These methods if used separately, cannot solve all the problems of face detection like orientation, pose and expression. The difficulty one face with the emotion recognition is basically due to the following: There is a moderate size database for training images, based on input image whether it is a static frame or it is a transition frame it becomes difficult to classify the emotion (Saaidia et al., 2014).

For real-time detection in which facial expressions differs dynamically, it is very difficult to detect emotions. In the present emotion detection application examine static images of facial emotions. We will inspect the system that will do the emotion recognition in real time with a live video streaming. Computation of frame-by-frame classification is necessary for live detection. So, we have developed a system for detecting emotions in real time. The result we achieved is an innovative system where an emotion-indicating text is displayed on screen.

The aim of the project is to come up with a solution to problem of emotion detection by dividing it into sub-problems. The scope of project does not only the two problems which will tell us whether a human face is detected or not, but also the multi-class problems that will take the user input, to start detecting the face and afterwards starts with a live emotion detection. For this different methodologies and techniques for dataset training, selection and classification, solutions to the problems as well as taking the computational complexity and timing issues has been considered (Busso et al., 2004). The major objective of the project is to implement emotion detection in terms of run time on the embedded system. Various Hardware Resources has been used to achieve the goal. Also, various algorithms and methodologies are studied to attain the desired goals. Such type of emotion detection system can be useful for our day to day tasks. This system may would help the human life in near future. The typical application for this system is listed here: Business Meetings, Social Gatherings, Teaching Assistant, Education, Audio-Visual Speech Recognition, Gaming Experience, Multimedia (Kotsia et al., 2007).

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