

# A STUDY OF FACTORS AFFECTING FACE RECOGNITION

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## Abstract

Face recognition has been one of the most interesting and important topic in research fields as it deals with security and privacy. The human face plays a critical role in our social association, passing on individuals' identity. The reasons come from the interest in the design of human-computer interface and in human visual system on face recognition. These involve knowledge of different domain and researchers from different disciplines such as neuroscience, psychology, computer vision, pattern recognition, image processing, and machine learning, etc. In this paper we will study several factors that result in difficulties of face detection and face recognition.

**Keywords:** Face Recognition, Face Detection, Feature Extraction.

## 1. INTRODUCTION

In this paper, we focus on image-based face recognition. Given a picture taken from a digital camera, we'd like to know if there is any person inside, where his/her face locates at, and who he/she is. However, we generally separate the face recognition procedure into three steps: Face Detection, Feature Extraction, and Face Recognition.



## 2. Face Detection

The main function of face detection is to determine (1) whether human faces appear in a given image or not, and (2) where these faces are located at given image. The expected outputs of this step are patches containing each face in the input image. Hence to make face recognition more robust and efficient to design, face alignment are performed to justify the scales and orientations of these patches. Besides dealing as the pre-processing phase for face recognition, face detection could be used for region-of-interest detection, retargeting, video and image classification, etc.

## 3. Feature Extraction

After the face detection step, human-face patches are extracted from images via feature extraction phase. If we use these patches for face recognition directly, it may have some disadvantages; first, each patch usually contains over 1000 pixels, which are too large to build a robust recognition. Second, face patches may be taken under different illumination, with different face expressions, and with different camera alignment, and may suffer from occlusion and cluttering background. To overcome these drawbacks, we perform feature extractions to do dimensionality reduction, information packing, salience extraction, and noise cleaning. After this step, we transformed face

patch into a vector with fixed dimension or a set of fiducial points and their corresponding locations. We can include feature extraction either in face detection or face recognition as per survey form some literatures.

#### **4. Face Recognition**

After formulizing each face patch in the above steps, the last step is to recognize the identities of these faces. For face recognition, a face database is required to build. For each individual, several images are taken and their features are extracted and stored in the database. Whenever an input image came, we perform face detection and face extraction and after this we compare features of each face with stored database.

We generalized two applications of face recognition: identification and verification. Face identification means given a face image, we want the system to tell who he / she is and indentify the individual ; while in face verification, given a face image and on the basis of a guess from the identification, we want the system to tell true or false about the guess. Face book utilizes facial acknowledgment programming to help mechanize client labeling in photos. Here's the means by which facial acknowledgment works in Face book: Each time an individual is tagged in a photo, the software application stores data about that individual's facial qualities. At the point when enough information has been gathered about a man to recognize them, the framework utilizes that data to distinguish a similar face in various photos, and will along these lines recommend labeling those photos with that individual's name.

#### **5. Factors of human appearance variations**

There are several factors that may result in difficulties to perform face detection and face recognition. Face patches may be taken under different illumination, with different face expressions, and with different camera alignment, and may suffer from occlusion and cluttering background. Some of the factors we need to concern are: face pose, face expression, illumination, RST (rotation, scale, and translation) variation, cluttering, and occlusion.

##### **5.1 Illumination**

The appearance of a face will vary drastically when the illumination changes. Variations in lighting conditions make face recognition an even more challenging and difficult task. The illumination changes have been discussed in numerous face detection and recognition researches. This variety is caused by different lighting conditions in which the picture is taken and is considered to have bigger appearance contrasts than the distinctions caused by various personalities. Under some enlightenment conditions, we can neither guarantee the recognizable proof nor precisely call attention to the places of facial highlights.

##### **5.2 Face Pose**

The pose variation results from different angles and locations during the face recognition process. This variation changes the spatial relations among facial highlights and causes serious distortion on the customary appearance-based face recognition algorithms such as eigenfaces and fisherfaces.

### 5.3 Face Expression

Human uses distinctive facial expressions to express their sentiments or tempers. The appearance variety brings about the spatial connection change, as well as the facial-highlight shape change. Facial expressions can be partitioned primarily into six basic emotions, referred to as happy, sad, disgust, surprise, fear, and anger. It is shown by different research group that the sort of emotion expressed impacts the accuracy of any expression recognition system.

### 5.3 RST (rotation, scale, and translation) variation

The RST (rotation, scaling, and translation) variety is additionally caused by the variety in image acquisition process. It brings about difficulties both in face detection and recognition, and may require thorough searching in the detection process over all possible RST parameters.

### 5.4 Clutter Background

In addition to the above four variations which result in changes in facial appearances, we likewise need to think about the impact of environments and backgrounds around individual in images. The cluttering background influences the accuracy of face detection, and face patches including this background additionally reduce the execution of face acknowledgment calculations.

### 5.5 Occlusion

The occlusion is one of the most difficult problems in face recognition and face detection. It means that some parts of human faces are unobserved, especially the facial features.

## CONCLUSION

In this paper, we studied several factors that result in difficulties of face detection and face recognition. Mostly the real world applications are sensitive to these factors. There are many algorithms presented in literature to solve these problems. Further factors: illumination-invariant, multi-view detection and recognition, and partial observation can be studied for research work.

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