



# **Higher Dimensional Vector Space Component Analysis Technique for Face Recognition - A Review**

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**ABSTRACT:** Face recognition is one of the most challenging areas in the field of computer vision. In this thesis, a photometric (view based) approach is used for face recognition and gender classification. There exist several algorithms to extract features such as Principal Component Analysis (PCA), Fisher Linear Discriminate Analysis (FLDA), Image principal component analysis (IPCA), and various others. Higher Dimensional Vector Space Component Analysis Techniques for Face Recognition is used for the dimensional reduction and for the feature extraction. Two face databases are taken in which one database contains the face images of male and one contains face images of females. On the basis of Euclidean Distance classification of the gender is done. Comparison between Euclidean Distance and Mahalanobis Distance for face recognition is also done with different number of test image.

**KEYWORDS:** Principal Component Analysis (PCA), Linear Discriminate Analysis (FLDA), Image principal component analysis (IPCA), Higher Dimensional Vector Space Component Analysis Techniques for Face Recognition is used for the dimensional reduction and for the feature extraction

## **I.INTRODUCTION**

A face recognition system is one of the popular Computer Application for automatic verification or identification of any person either from a given image or from any video source. Face recognition is mainly used for the security purpose and one can compare this with the other biometrics like fingerprint, iris recognition system. The main advantages of a face recognition system over the other biometrics application is that it not necessary need to ask the person to come in front of camera or in any sensor like in other it required the person should take his body in front of the sensor and stay there for few second. For the face recognition if a person is simply walking from any surveillance camera it can capture information of the person without his/her knowing about that and can identify or verify the person. In a face recognition problem we are simply giving an input image and the facial database of the person known individuals and it identify or verify the given image. There are basically two approaches for the face recognition: geometrics (feature based) and photometric (view based). In the geometrics we need to select only some distinctive features like nose, eyes, mouth and measure the geometric relationship among these facial points. The mostly used algorithm for face recognition is Principal Component Analysis (PCA) is example of photometric based approach.

Face recognition steps: The face recognition is mainly done by performing the following process:

- a) **Image acquisition:** This is the very first step for the face recognition in this required to acquisition of any image either by camera or by any other source.
- b) **Image Pre-processing:** Some pre-processing is required to perform before using the acquired image for the recognition.
- c) **Face detection:** After doing the pre-processing now it required to detect the face from the given image. Since for performing the face recognition we basically need a face of any person. So the face detection is done before performing the face recognition.
- d) **Feature extraction:** The next step after face detection is extracting the important features of the face which can be used for comparing with the image database of individuals.



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- e) **Declaring a match:** After performing the above steps it required to identify or verify the given image from the database. In this we can classify any given image in face or non-face or in any other groups according to the requirement. The face recognition is mainly used for the verification and identification.

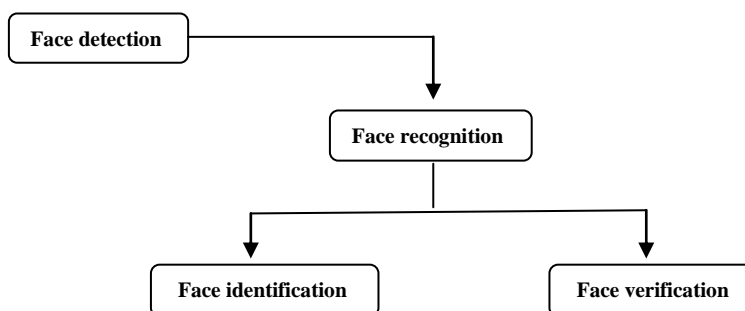
## A. FACE RECOGNITION TECHNIQUES

Traditional: There are some algorithms which extract the facial features or landmarks from an image for example the position of nose, eyes, jaw and cheekbones. After extracting these features, then it is used for the matching the similar features in the image database.

- 3-dimensional recognition: Now days the 3-dimensional recognition technique is very popular and mostly used for the face recognition. Other techniques are not that much more accurate in the different lighting and in non-frontal view, but in 3-D recognition there is no effect of changes in lighting. In this technique, it required a 3-D sensor for getting the information about the face surface. Then this information is used for identifying or verification of any person.
- Skin texture analysis: The visual details of the skin are used in this technique which are captured in standards digital image or scanned image. This skin texture analysis improves the performance on the recognizing the face.

## B. THE MAIN USES OF FACE RECOGNITION

The face recognition is mainly used for the two purposes, identification and verification. Means by using the face recognition system a person's identification or verification can be automatically done



**Identification:** In the identification a face recognition system takes an input image and compared it with all the other images in the database and in result it gives the rank wise list of the matched image. In the identification one image is compared with all the images in the database and the image which will be similar to the input image will be the output.

**Verification:** In the verification a face recognition system takes an input image and claim of identity and compared it with who they say they are and it give the answer yes or no. In verification one to one comparison is done by the system means the input image is compared with already specify an image in the database and if it will match it will give a yes answer otherwise it will give no answer.

## IV. FACE RECOGNITION STEPS

The face recognition is mainly done by performing the following process:

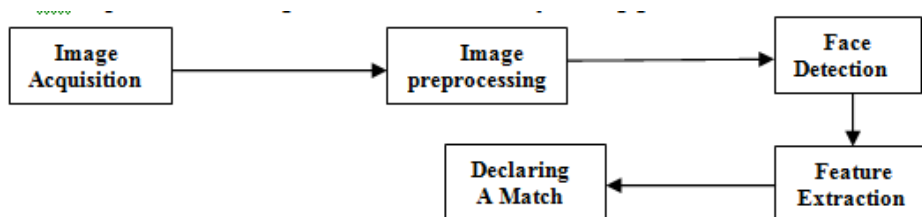
- a) **Image acquisition:** This is the very first step for the face recognition in this required for acquisition of any image either by camera or by any other source
- b) **Image Pre-processing:** Some pre-processing is required to perform before using the acquired image for the recognition.
- c) **Face detection:** After doing the preprocessing now it required to detect the face of the given image. Since for performing the face recognition we basically need a face of any person. So the face detection is done before performing the face recognition.

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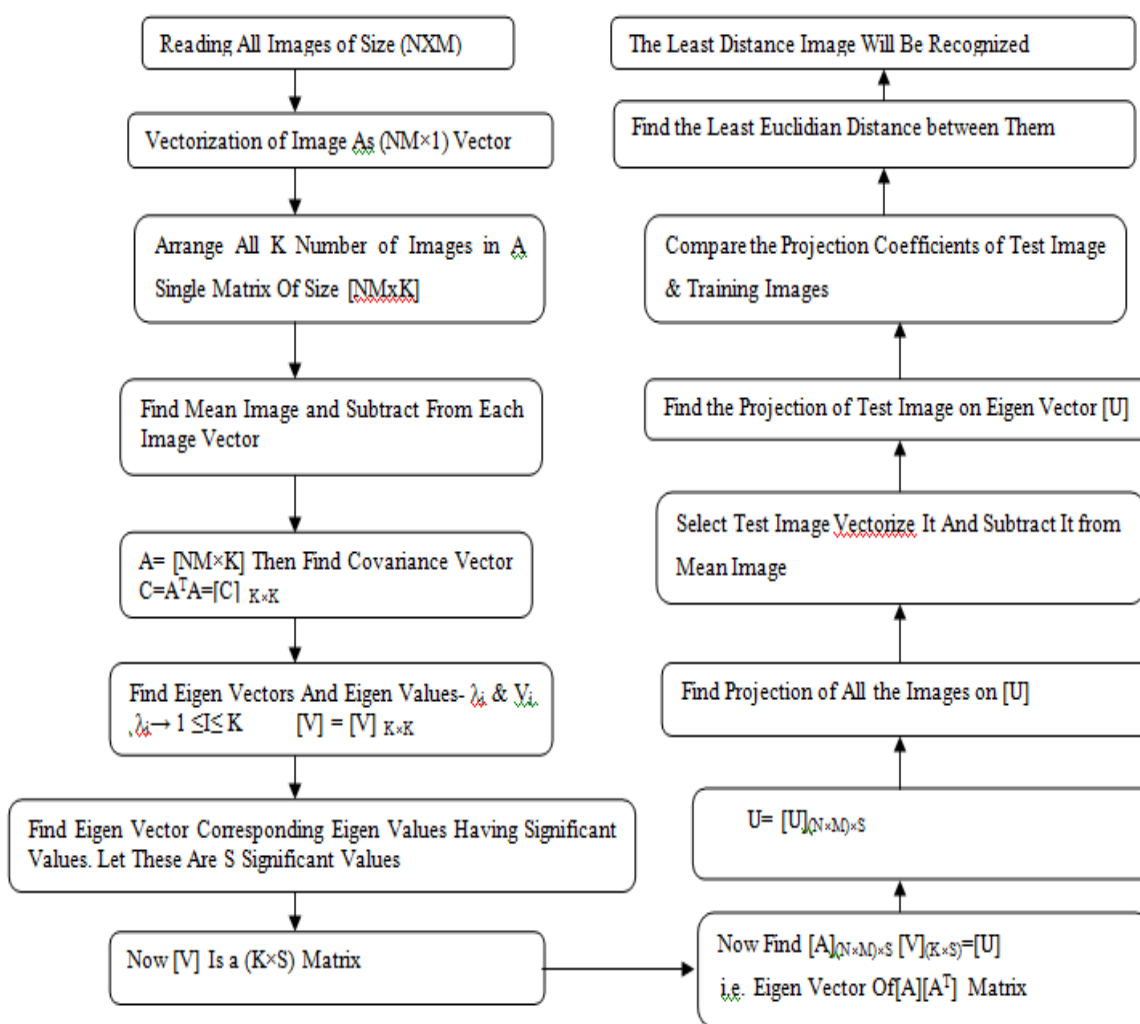
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- d) **Feature extraction:** The next step after face detection is extracting the important features of the face, which can be used for comparing with the image database of individuals.
- e) **Declaring a match:** After performing the above steps it required to identify or verify the given image from the database. In this we can classify any given image in face or non-face or in any other groups according to the requirement. the steps for face recognition can be shown by the fig given below.



## V. ALGORITHM





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## VI. CONCLUSION

Face recognition is one of the most challenging areas in the field of computer vision. it is used in different area. The prime use of these techniques is for security purpose where we have to identify the criminals with list possible error out of number of methods The Higher Dimensional Vector Space Component Analysis Techniques for Face Recognition is most efficient and fast method which gives perfect result even for a very week input.

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