

# Implications of Deep Learning-Based Methods for Face Recognition in Online Examination System



Sujata Patil, Yogesh Kumar Sharma, Ranjit Patil

**Abstract:** In the recent era, the importance of surveillance-related applications is increasing rapidly. In such applications, Face Recognition is becoming an emerging, fast-growing research field in the security authentication systems. Face recognition becomes one of the biometric techniques for identifying individuals face in digital images or in the stored image. It has various applications in biometrics, military, video surveillance and so on. In an earlier age, face recognition techniques implemented using a traditional approach like holistic based, hybrid and feature-based. In the traditional system, there are a number of issues like light illumination, occlusion problem, different facial expressions, and poses of the particular individual. These factors are affecting the accuracy and efficiency of the face recognition system. Nowadays there is an advancement in the technology and methods which are used in the face recognition system. The new methods and techniques of face recognition are devised by deep learning methods. The research focuses on a proposed model developed by using some Deep Learning methods and frameworks for face recognition. This model plays an important role in the authentication of an individual in the online examination system in educational institutes. Multi-level authentication is used for authenticating individual and to have crosschecked over throughout the examination period. The Deep Learning methods and frameworks overcome the issues raised in face recognition by traditional methods. This proposed model used for the authentication of an individual in educational institutes where online examinations are conducted.

**Keywords:** Face Recognition, Deep Learning, Biometric, authentication, Framework

## I. INTRODUCTION

In today's world of technology, there is a substantial increase in the usage of internet technology and because of that the manual systems and processes are getting converted to automated systems. In these systems authentication or verification have a vital role in their success.

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In earlier days, the traditional method uses text-based user ids and passwords which further converted into 3D authentication along with the text. Face recognition is the most important technique in computer vision for recognizing and authenticating a particular individual in still images or videos stored within the database. Nowadays new forms of authentications such as biometrics are preferred because these are non-intrusive techniques.

The techniques can be palm-based, iris-based and facial or image-based authentication techniques are used and in recent years. These biometric techniques overcome the problem occurred by using traditional security methods. There are numerous ways facial recognition system can work, however in overall it works by comparing certain facial features from a particular image with faces stored within a database. In present-day, face recognition technology plays an essential role in a number of applications, surveillance system, security monitoring, "Smart Card" applications, human-machine interaction, general identity verification, and tracking systems [1]. India is one of the biggest youngster countries where around 50% population is youngsters and as per the recent survey Indian government has promoted education to masses by starting Sarvashikshan Abhiyan and by providing free education to girl students till 12th and by launching various scholarship schemes to students of backward communities as well as to all the scholars and minority students. As education is an important fragment for growth of individual and of a nation, so it has become compulsory to inculcate different skills among the students that is why different educational patterns are introduced in India such as annual pattern, semester pattern, credit pattern, etc.

In the educational system, one of the important modules an examination is where doing the assessment of a student is a challenge because to have the prompt assessment, accurate assessment there is a need to have some online tools. Assessment can be of internal as well as an external mode where the maximum time of teacher is getting wasted in the process of assessment. To avoid all these issues the mode of online examination is introduced at the number of the institutes but the security and authenticity are the main concern which comes ahead. The numbers of the organization have taken solution by providing user id and password to the students.



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Later on they started providing biometric authentication but still, the concern related to the authenticity of an individual remains unanswered at the time of examination.

In this paper, we proposed one model in which the care is taken for authenticity, authorization, reliability by providing a multilayered

authenticity model and by presenting a new way through a face recognition system.

## II. FACE RECOGNITION STRUCTURE

Generally, the face recognition technique consists of the following steps.

**1. Detection of Face:** Initial step in face recognition process is face detection. It is considered as an important part of the face recognition process. The face detection process is the extracting facial part from the input scene or video.

**2. Feature Extraction:** After face detection next step is extracting essential features from the image.

**3. Recognition of Face:** In this stage, the face images are verified or identified by relating the extracted facial features by using some classification algorithms.



Fig.1: General Structure of Face Recognition System

Face recognition is the most stimulating biometric technique when it is used in unconstrained environments. Some of these typical differences found in images such as poses, aging, occlusions problem, lightning environments, and facial expressions.

## III. TRADITIONAL FACE RECOGNITION METHODS

The techniques used in face recognition have shifted considerably over the years in most of the surveillance systems. In the traditional approach, face recognition detects facial features from an image. The facial features are then extracted from the image of the face. The traditional techniques for face recognition depend on features, like edges and texture descriptors [8]. The algorithm is used in this approach is a holistic-based approach. The difficulty in identifying features using traditional methods is that in unconstrained environments like varying illuminations, different head poses, and occlusion of faces. These problems are faced by traditional methods that's why in many applications, like surveillance and monitoring, the traditional biometric techniques not that much appropriate.

The following traditional methods are used in face recognition.

1. Holistic Face Recognition
2. Feature-Based Methods
3. Hybrid Methods

### A. Holistic Face Recognition

This approach uses faces using the complete facial region. In holistic based approaches, recognition is done based on

global features from faces to perform face recognition and verification. The small global features are derived from pixel information of face images. These features capture the difference among individual faces and because of that it is used to uniquely recognize individuals. This approach takes the whole facial region as input data [3]. PCA is one of the popular approaches.

A holistic approach can be categorized into the following:

### 1. Principal Component Analysis:

Facial images generally have high dimensionality i.e. many pixels. Faces have common patterns that can be taken in lesser dimensions. This is a statistical approach that is used to decrease the number of face recognition variables [5]. Each image in the training set is implied in the form of linear combination of eigenvectors called eigenfaces. It is based on multiple face images as input. PCA is a mathematical tool to decrease multidimensional data to lesser dimensions. PCA takes less computation time as compared to other methods. But there is the limitation of PCA method is it is not powerful as compared to new methods [2].

### 2. Linear Discriminant Analysis:

Linear Discriminant Analysis is also called as Fisherfaces. It is an appearance-based method used for the extraction of feature and dimensionality reduction [7]. This method can perform face recognition for a single input image [9]. It is used broadly in face recognition. It is also known as Fisher's discriminate analysis. It is a great face recognition technology that overcomes the problems of PCA. Linear Discriminant Analysis used for classification. It clusters images of the similar class and splits the images of different classes of the images. LDA is not used for multiple images [6].

### B. Feature-based Methods

In feature-based faces are recognized using local features from faces. The feature-based approach considers the distinct feature of the face like mouth, nose, mole, ears, eyes and matches the resemblance between the images and uniquely recognize a person. An enormous challenge for feature extraction methods is the restoration of a feature when the system attempts to regain features that are invisible due to huge differences [4].

### C. Hybrid Methods

This method is a mixture of the feature and holistic-based approach. In this approach, the whole and local face features have used the input to face recognition system [7].

In the above mentioned traditional methods, performance of Face Recognition system is degraded under different postures, light conditions, facial expressions, unnatural obstacle, and age. A new system is proposed to eliminate the limitation of posture, light conditions, and differences in expression. The deep learning technology has been accepted as the best research track of face recognition. Deep learning algorithm takes much less amount of time for execution. If we do the comparison with a traditional algorithm like KNN testing time will increase on increasing the volume of data.

#### IV. DEEP LEARNING APPROACH FOR FACE RECOGNITION IN ONLINE EXAMINATION SYSTEM

Face detection and recognition is an essential field in the computer vision and one of the challenging fields in research. As a result of years of research, currently, there are various machine and deep learning algorithms and frameworks applicable to recognition face. In the recent era, Convolutional Neural Network achieved advanced results in detection of Object and classification of an image. Deep learning permits multiple models that are prepared from multiple layers to learn features or patterns of data. Deep Learning approach desires to have the high-end structure to train data in a reasonable time.

Deep learning really useful when it comes to some difficult problems such as the classification of an image and size of data should be large. In order to proceed efficiently with the large size of data in some specific time, special information technologies are needed. Nowadays such information technologies can be represented by Deep Neural networks. With the help of Deep Neural networks to learn effective characteristic representations has to turn out to be popular for face recognition. It also has a greater efficiency of the non-linear transformation and data representation in comparison with traditional neural networks.

#### V. PROPOSED MODEL FOR ONLINE EXAM AUTHENTICATION

The step by step working of the proposed model is as follows:

**Step 1:** Initially user should do the registration in advance and if the registration is successful then users are assigned user id and password. The registered user whose information along with photograph is stored in the database and which will be cross-checked at multiple levels for keeping him/her to be continued in the examination.

**Step 2:** Once the user makes an attempt to enter in the system and if that user is already registered then immediately user's image will be captured.

**Step 3:** Image will be matched with the stored image with the help of the different pattern matching techniques. If pattern matches then only the user will be continuing his/her examination otherwise user will be sent back for authentication or check to see if proper registration has been made.

**Step 4:** User continues the examination but to have authorization of individual during the examination period,

randomly the snaps of individual will be taken from different pose and different angle and at the background; it will be matched with stored images in the database. At any moment of time if it is observed that examinee images are not matching then the user will be sent out of the examination by treating him/her as an unauthorized user and will not allow continuing to examination.

**Step 5:** The process continues until the duration of examination by classifying that image on the different parameter of pattern matching which is used in pattern matching framework and algorithm.

**Step 6:** This process provides three-layered authentication

and authorization mechanism for validating of the user and at all the validity check if the user found valid then only final examination submission of the user will be accepted by the system.

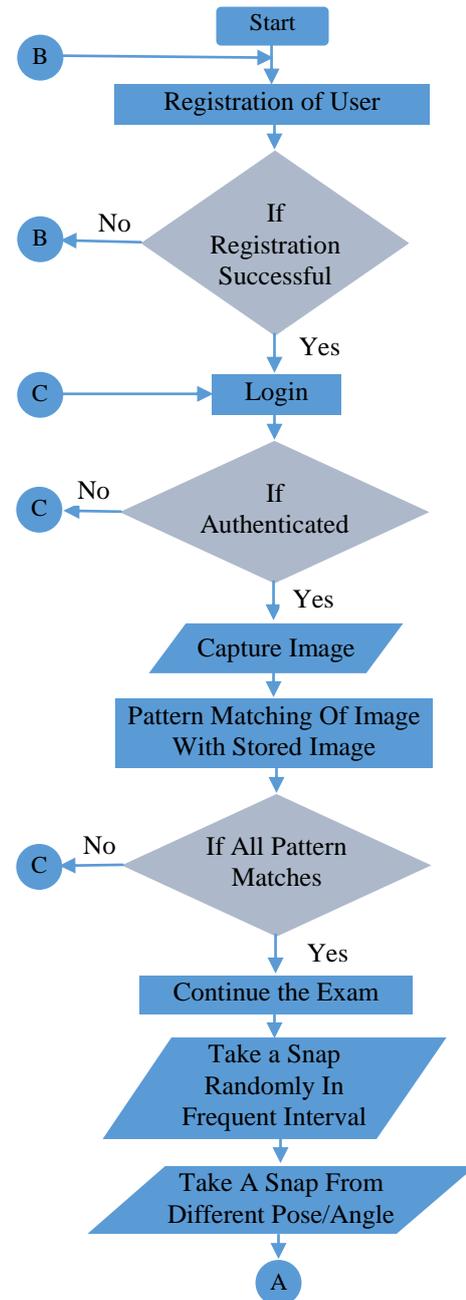
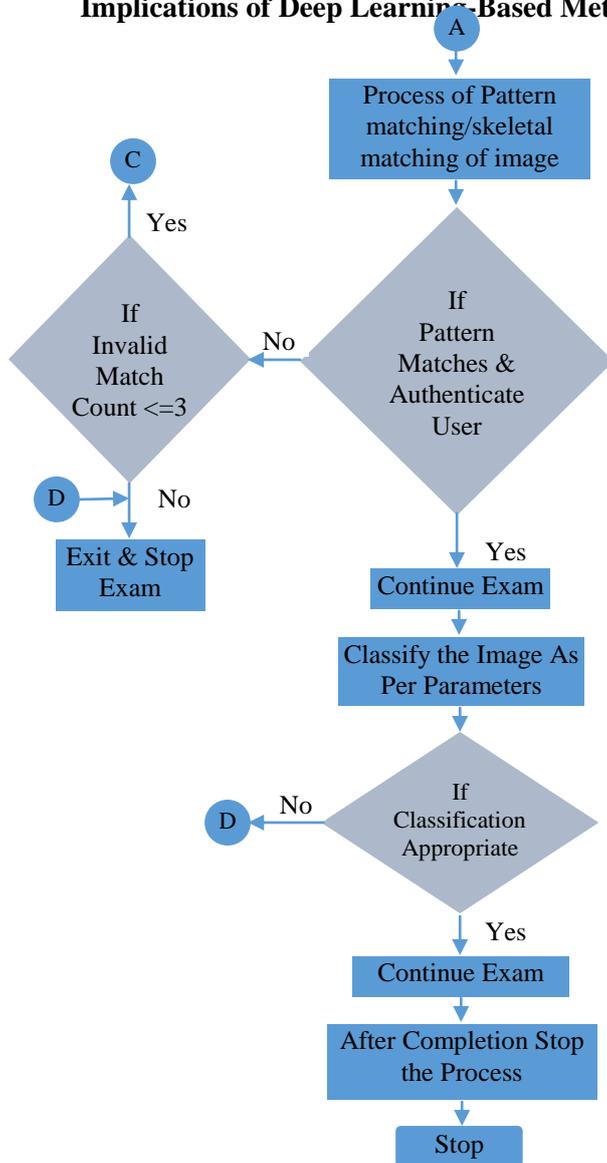


Fig. 2: Architecture of Online Exam System

If the user's invalid match count exceeds more than three times then that user will not be allowed to continue the exam and that examination will be canceled out there itself. In this paper, the model is proposed to have verification of individual throughout the examination period and that check has been done through a face recognition system. Also, the behavior of an individual is predicted by using sentimental patterns.

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Cont. of Fig. 2: Architecture of Online Exam System

## Observations:

It is observed by the researcher that

1. The traditional examination system is a rigid system.
2. It has many loopholes.
3. As it is the manual system, chances of manual mistake and error are more.
4. It is a time-consuming system as compared to the online system.
5. In this system, the evaluation method is not a fare which may vary as per the individual organization, the mood of the individual, skills of individuals, etc.
6. In the traditional system, more weight is there for supportive components than core components.
7. The traditional system is not a specific and more standardized, structured that is why it is more tedious and difficult to use.

Considering all above issues researcher has proposed an automated authentication and verification system in the online examination. The researcher has identified some

online systems are not standardized and structured. Also, they are not enhanced and do not able to get it to understand

by the normal users and due to which difficulty level is comparatively more.

## The proposed system is aimed to address the following:

- This system is more structured, secured and time-bound.
- This is a unique model proposed which can have multilayered security.
- This model is also supporting cascading of various media to ensure the highest level of security.
- The proposed model is designed and is using recent frameworks and algorithms of machine learning, Artificial Intelligence, and deep learning. So can expect that this can able to support the security constraints at least for a few years to come.
- This is a prototype model and can be modularized and customized as per the specific application.

Now the user is intending to propose model only for online examinations but can also implement and do similar implementations in many more applications such as individual tracking, object tracking, Object identification, Classification, and authentication, etc.

## V. FUTURE SCOPE

This proposed model can be implemented by using Deep Learning-based algorithms and frameworks which captures the image and with the help of different deep learning methods of pattern recognition will analyze the image for achieving a maximum level of authenticity on basis of various parameters. This model can have a great impact on to improve the examination system in educational institutes and the same model can be used for any system where authentication is needed.

## VI. CONCLUSION

Face recognition which is implemented in real-time helps to recognize the human faces can be used for individual identification and authentication. The traditional face recognition approach works better under a constrained environment. But the number of issues of the traditional system like light illumination, occlusion problem, different facial expressions, and poses of the particular individual can be overcome in the proposed model. This model also overcomes the limitations of the unconstrained environment.

The future works include the implementation of this system by using Deep Learning frameworks and algorithms. The computer-based online evaluation system which has made system robust and the human efforts are reduced and have also increased the percentage of accuracy and reduced the delay in the assessment mechanism.

- It is observed that like other authentication techniques face recognition can be used a new tool for authentication for an individual.
- Face recognition system increased levels of security and the proposed model focus on 3-tier authentication system.

- The proposed model is planned to be implemented at an initial level for examination module where time, security, accuracy, Robustness of the system increases and it gives a transparent mechanism for examination conduction.
- In the proposed model has given the more structured way of authentication and even by taking snaps from different angles with different poses and at different interval gives the realness to the system.

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