



Yolo Based Face Recognition System For Deep Candidate Tracking

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Abstract — Many different fields, such as autonomous attendance devices based on face recognition, employee attendance records, safety, protection, and police applications like identifying thieves in photos that aid in their capture, can benefit from the gathering of images from cameras or closed-circuit television cameras and the application of recognition outcomes based on facial detection and recognition. With face detection and recognition technology, we can reduce human labour and improve security when it comes to recording student attendance for lectures, labs, or sections. This system allows the lecturer or faculty member to make options about who to record the attendance of each student. It saves a great deal of time and work, particularly in large class lectures. Exam-related concerns can be resolved with the use of this pupil's history, which is utilised in the monitoring system to demonstrate the application of facial detection tools. The suggested system uses the Haar cascade technique for facial feature identification and segmentation. It is a CNN-based facial identification method. Comparing the proposed method to state-of-the-art methods, it reached precision of 98%.

Keywords — Artificial intelligence, Face recognition, Deep learning, Face expressions, Internet of things.

1. Introduction

Artificial intelligence often struggles with face recognition. In everyday situations, this programme is utilised a lot. Numerous smartphones were opened phones equipped with facial recognition software to protect personal information and to identify Facebook members instantaneously when they appeared in images. Although many techniques for identifying faces have been proposed up to this point, it is still quite challenging in practical applications [1]. A fundamental method of distinguishing individuals relies on a number of factors, such as lighting, variation in posture, and partial face occlusion. Interior and exterior variations can quickly impact identification of faces, and conventional face recognition techniques frequently struggle to produce the best outcomes[2]. This research offers a face recognition technique based on modified convolutional neural network that substantially boosts the detection accuracy of existing face recognition systems. Tests demonstrate that the enhanced algorithm can be used with the data set in an efficient manner.

The extraction of human facial features from a picture using typical technology for facial recognition takes a long time to be processed[3]. The retrieved face features limit the precision of recognition in order to prevent the impact of facial characteristics. This research investigates deep learning-based facial recognition systems with an eye on the aforementioned issues. The HOG function is employed to identify the target look and orientation on the face and the facial alignment manipulation is carried out in order to identify the image. Identification of faces is achieved by using a neural network once the image's facial recognition components have been retrieved. It is confirmed through comparative studies with conventional face recognition methods that deep learning-based recognition technology has greater recognition flexibility and increases recognition performance by approximately 1.5 times.

The most crucial feature in identifying a person is their face. Since each person has a unique identity, facial recognition technology aids in verifying the identity of any individual based on those traits. The process for validating any kind of facial information is broken down into two stages [5]. The first stage involves swiftly detecting faces, with the exception of situations when the object is positioned fairly far away. Once this is done, the second stage begins, in which the faces are identified as unique individuals. Three major issues with video-based facial recognition systems are addressed by the suggested system: multi-person recognition, in-the-wild recognition, and end-to-end computational challenge. In order to reduce the computational overhead from the other units in the recognition pipeline, this takes advantage of advanced deep neural networks for face detection and extraction of facial features. A thorough assessment demonstrates that the suggested system can successfully identify faces in unrestricted settings, at high frames per second rates [5].

The proposed approach focused on developing a robust model with reliable feature extraction procedures.

- The HAAR Algorithm is used to identify faces in numerous student photos, and only one face per student is trained at a time. Once his profile was created, the camera is used to follow them whether or not they were in class.
- If a student is present, the system records his ID, name, and time and automatically grants him attendance. Staff members that arrive early or late can benefit from this following an update to the attendance record.
- The specific staff members can receive the attendance details by sending them via mail. The time and difficulty involved in manually recording attendance are reduced with the use of this technology.

2. Background Study

H. Jiang et al. (2021) This paper presents the AFC-XFR framework, which is based on accurate facial compositions. The following components make up the architecture: the Self-awareness based rebuilding Module (SARM) for serialised feature connection, the Local Highlights Enhance Module (LFRM) for conceptual feature improving, and the main structure for feature extraction. The final two modules convey fifteen conceptual characteristics that are precisely captured from local facial features using the suggested acquiring structure. Furthermore, we are able to establish clarity from the standpoint of model choice by using the LFRM to empirically verify three important insights[6].

Y. Said et al. (2020) The goal of this work is to create a face recognition application for a convolutional neural network-based fingerprint structure. It suggests a Deep Learning model structure that enhances the current state-of-the-art in terms of processing quickness and accuracy. Convolutional Neural Network (CNN)-based Face Identification System structure is offered here[8].

T. Alobaidi et al. (2019) This paper presents a prototype of a face identification system using values from two non-orthogonal transformation fields: 2D distant cosine transform (2D DCT) and Multifaceted Discrete Wavelet Transforming (2D DWT). These values have been demonstrated to significantly reduce calculating issues and final file size while preserving the outstanding accuracy from the Combined Wavelet Cosine Lacking Representation for facial identification (MWCSRFR) system[10].

Pranav et al. (2020) This paper proposes the development and assessment of a Convolutional Neural Network (CNN) based actual time facial identification system. Regular AT&T information sets are used for the first assessment of the design that is suggested, and the same information sets are later extended to the design of an actual-time system. Additionally provided are specifics regarding the CNN tuning of variables that was done to evaluate and improve the suggested system's recognition accuracy. To improve the system's performance, an orderly method to optimising parameters is also suggested. The suggested system achieves greatest detection accuracy of 98.75% and 98.00% when typical data sets and instantaneous inputs are used, respectively[12].

Singh et al. (2023) The VGGFace deep learning neural design serves as the foundation for the suggested database-based built structure. The model is trained again using pass on instruction on a reduced unique customised information set consisting of 7500 photos of 26 different people. In order to assess and enhance the detection precision of the suggested system, specifics about the development of unique customised datasets and quick experiments using different machine learning and deep learning techniques are also provided. With a mean average of 96.54% on real-time inputs, the suggested method correctly recognises each of the 26 people, demonstrating an exceptionally high degree of identification reliability. The assurance levels range from 78.54 percent to 100%[15].

Various existing models are considered here as the state of art approach implemented in the previous research. The challenges faced in the existing models are considered as the key for developing a new model in face recognition system [16]-[22].

3. Proposed Methodology

A. System architecture

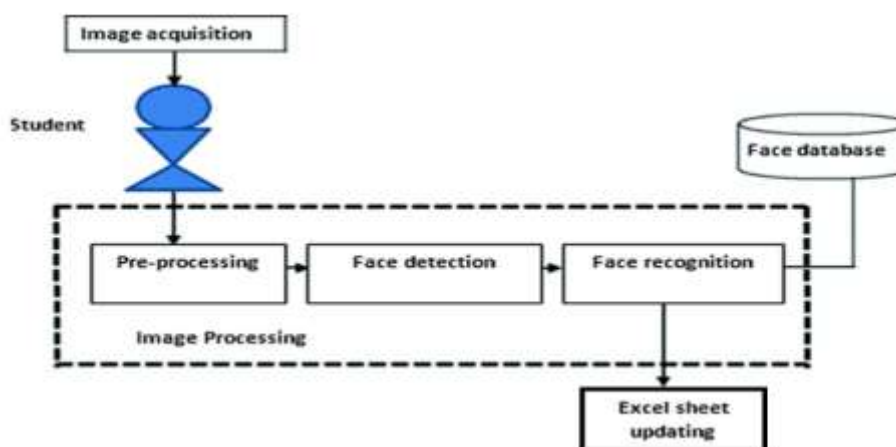


Fig 1. System architecture of proposed system

Fig 1. Shows the system architecture of proposed face recognition system.

B. Haar Cascade algorithm

An efficient technique of identifying objects is to use object detection using Haar feature-based cascade classifiers. This method is based on machine learning, and it involves training a cascading algorithm with a large number of both positive and negative images.

Next, it's applied to identify objects in additional pictures. To train the classifier, the method first requires a large number of positive images, or images with some faces, and negative images, or images lacking faces. The next step is to take away its features. They resemble our convolutional kernel exactly.

The total amount of the pixels beneath the white rectangle and the total number of the pixels beneath the black rectangle are subtracted to create one integer for every characteristic. Many characteristics are now calculated using all potential kernel locations and sizes.

The system calculates the total number of pixels within white and black rectangles for each feature computation. To optimize this process, the authors propose using integral images. Integral images streamline the calculation by reducing the pixel sum computation to a process that requires only four-pixel values. This method significantly speeds up the computation, producing results rapidly and efficiently by simplifying the process of determining the number of pixels in various regions of the image.

C. Convolutional neural network

Convolutional neural networks, also known as CNNs or ConvNets, are an assortment of deep neural networks used in deep learning that are primarily employed for evaluating pictures. Because of their shared weights building design and recommender systems for categorising images, clinical image analysis, natural language processing, and time series data analysis, they are also referred to as shift invariant or space invariant artificial neural networks (SIANN).

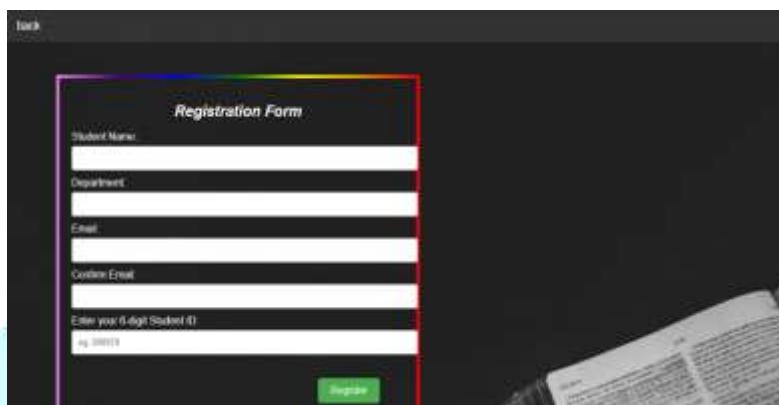
Multiple perceptrons are regularised variants of CNNs. Translation invariance properties are typically found in multilayer perceptrons. They have completely interconnected networks, meaning that every neuron in one layer is connected to every other layer's neuron, and they have usages for both video and image detection.

D. Working summary

The HAAR Algorithm is used to identify faces in numerous student photos, and only one face per student is trained at a time. Once his profile was created, the camera is used to follow them whether or not they were in class.

If a student is present, the system records his ID, name, and time and automatically grants him attendance. Staff members that arrive early or late can benefit from this following an update to the attendance record. The specific staff members can receive the attendance details by sending them via mail. The time and difficulty involved in manually recording attendance are reduced with the use of this technology.

4. Results And Discussions



Registration Form

Student Name:

Department:

Email:

Confirm Email:

Enter your 6 digit Student ID:

Fig 3. Registration page

Fig 3. Shows the registration page designed for getting the student details such as name, registration number, email id, student id etc. these data are considered to identify the unique details of the student after face recognition is done for making attendance registration.



STAFF Login

Username:

Password:

This page is exclusively for administrators

Fig 4. Admin login

Fig 4. Shows the admin login page considered for making the authorized persons to login, make new registrations, editing the existing registrations, validating the attendance etc.



Registered list

ID	student name	student ID	EMAIL	DEPARTMENT
1	regal	123456	abc123@gmail.com	eee

Fig 5. Attendance registration

Fig 5. Shows the attendance registered inside the database with unique ID, Student registration number, email and department. The authorized officials can enter the page and evaluate the attendance at any time using the admin login. The page is customized to provide department wise categorizing the attendance, so that the academic peoples can easily view, edit and evaluate the attendance.

A	B	C	D	E	F	G	H
date	student name	student id	email	department			
14-05-2023	I.sajak	22596	isaj123@gmail.com	eee			

Fig 6. Stacking of attendance

Fig 6. Shows the stacking of registered attendance into the XL sheet with data stampings for further accessibility. The proposed approach is further enhanced by evaluating the accurate development of YOLO model for face recognition and improving the detection rate.

Table 1. Comparison of proposed model with existing systems

Reference	Methodology	Performance Metrics
Huda Al Nayyef et al. (2023)	Hog transform, CNN	Accuracy 95.6%
Dixit et al. (2024)	Deep RESNET model	Accuracy 90%
Kamil et al. (2023)	OpenCV SVM	Accuracy 81.8%
Proposed Model	Haar Cascade and YOLO model	Accuracy 98%

Table 1. Shows the performance measure of existing state of art approaches utilized for face recognition based candidate tracking system in which [23] discussed HoG transform based feature extraction and Convolutional neural network (CNN) based classification model achieved the accuracy of 95.6%. In [24] deep RESNET architecture is utilized and achieved the accuracy of 90%, [25] through OpenCV library using python, Support vector machine(SVM) is developed achieved the accuracy of 81.8%. The proposed model with Haar Cascade algorithm with YOLO architecture achieved the maximum test accuracy of 98%. Comparing with Various existing approaches, YOLO model performed better in terms of achieving the accuracy.

5. Conclusion

Many different fields, such as autonomous attendance devices based on face recognition, employee attendance records, safety, protection, and police applications like identifying thieves in photos that aid in their capture, can benefit from the gathering of images from cameras or closed-circuit television cameras and the application of recognition outcomes based on facial detection and recognition. With face detection and recognition technology, we can reduce human labor and improve security when it comes to recording student attendance for lectures, labs, or sections. This system allows the lecturer or faculty member to make options about who to record the attendance of each student. It saves a great deal of time and work, particularly in large class lectures. Exam-related concerns can be resolved with the use of this pupil's history, which is utilized in the monitoring system to demonstrate the application of facial detection tools. Further the proposed model is improved by adding more database to make comparative analysis and testing the model performance with artificial intelligence (AI) mechanisms are recommended.

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