Tri Bird Technique for Effective Face Recognition Using Deep Convolutional Neural Network

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Abstract. The massive amount of data produced from Video content, has speedily grown up with surveillance data. Human beings can easily handle this data by greatly outperforming the capacity of technical and non-technical resources. In the current era of computer vision great characteristics like precision, effectiveness and interoperability of smart surveillance systems to retrieve data. Security surveillance systems rapidly increase Face value acknowledgement over different subsequent critical methods. In proposed research, deep CNN and deep BiLSTM methods were used for effective face recognition from video input. Generally, the said techniques efficiently handle challenges face recognition by combining the recompenses of computer vision and tri bird optimization. The proposed method can be used in many computer vision applications that help recognize faces. The hybrid deep model is developed using Distributed Deep CNN classifier and distributed BiLSTM classifier, which is optimized using the new optimization that is designed newly for your work. The new optimization is designed based on the characters of vulture, sparrow and crow. Then the output of the classifier is fed through the model by analyzing the face query to attain the retrieved relevant face. The outcome can be measured by enactment over the proposed supposed model and is analyzed through considering metrics such as accuracy, exactness, remembrance and F-value calculator which are implemented in the MATLAB tool to reveal the proposed face recognition method. The proposed model achieves 91.30% accuracy, 95.07% precision, 95.078% recall and 95.078% f-measures by deep convolutional neural network.

Keywords: Face recognition, Face detection, Ensemble model, Frame selection, Tri-Bird optimization, AlexNet101.

1 Overview

Object recognition acts as a vital character of the field in processor visualization and image processing. Face detection and Face localization problems are quite challenges, in some recent years that achievable millstones have been achieved. Such complex

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problems can be broken down into small one to handle things like face localization, face identification, face frame selection, face character extraction etc., [23]. Other activities, like ratifying faces or extracting more features from them, may be carried out in the interim. For solution several algorithms and methods, including Eigen faces or Active Shape models, have been used throughout time. However, in machine learning the main approach is Convolutional Neural Network (CNN). CNN has worked more efficiently in Image classification, Voice recognition, Image processing much more. Deep Learning (DL), particularly the Convolutional Neural Networks, is the one that is now most popular and producing the greatest results (CNN). The main objective of the research will be to design effective face recognition models on ensemble deep learning models. The most significant features are extracted using the ensemble deep model using Alexnet and Resnet-101, and the deep features will form the input to the proposed Ensemble deep model developed through optimizing the hybrid deep model.

After examining the situation of the present era, I chose to concentrate on studying these approaches since they are presently generating productive outcomes of excellent quality. These techniques can be widely utilized in picture-based safety and checking schemes, integrity and confidentiality, illegal examination, unimaginative nursing, and overall used applications like as a person and system edge. Object recognition first steps to locating the face in a selected frame, which is also called as localization of face and determining that is actual expression which is also presented as expression fortitude [1]. In the proposed system good performance and results of face recognition, more demand for facial images become more popular day by day [2]. Face recognition [24] is demanding in many fields such as human computer interface [3], social networking sites [4], security control and detective approach [5] [6], age estimation from facial image dataset [7]. The face recognition has increased outstanding to upgrading machine learning and pattern classification. Still, it has some obstacles in situations where locating few faces from crowds or where large numbers of calculations were in public places or extended dynamic crowds [1]. One more challenge to a real live video surveillance system where a new person identified by the system should immediately report to the end user or authorized person like the Police department [8]. Many researchers have recently worked on enhancement of facial recognition problems by using image as more potential for recognition and focusing on particular spatiotemporal configurations [9]. The reliability can be overcome by using deep learning techniques to train large amounts of datasets [10] [11]. In this improvisation many algorithms use the pooling data, but in reality, it becomes complicated. Examples for reel short video or film shoot in public places, hamper the individual privacy [12] [13]. There are multiple methods for face recognition introduced and used by many researchers. These methods get hooked on 2 different sections, among which 1st related through Graphic structures and 2nd methods which extract features by supervised learning scheme [1] [14][15]. Such a multiple method is used for face recognition tasks but in some days Convolutional neural networks provide good outcomes in various fields which are associated with face alignment and face recognition [14 - 17] [22-28]. Rather than identifying the special characteristic of different algorithms to extract features, CNN performs the same role to extract features while in training of the dataset [7].

The most popular (SVM) is mostly useful among rationalizing a dependable technique which can be cataloging improved facemask characteristics, here is generally analyzed based over the balanced value and SVM picks out the hyperplane to categorize the discriminant investigation structures [18]. While carrying out the face recognition task multiple factors are dependent like distinct view angle, dimensions, position of object, emotion on face, crowd intensity, multiple object appearance in one frame, radiance etc. affect the result [1]. All the previous methods having limitations with certain dataset used for processing, model affect result and trouble with analyzing the variety of face images dataset. Such a variety of face image or video input having these assemblages also go inside. Unattractive random changes, noised or filtered images, and low-quality pixels [18] [25]. Though object chasing and discovery is a high priority task, dynamic frequently crowd in fame tough task because of different angle and position view of capture, high person compactness and fluctuation in person appearance these factors study in some recent years [1]. One of the most important aspects affecting the performance is identification, localization of small appearance of face in large crowds in image difficulty. And on the other hand, when it is neighboring the capturing device like a camera, It is necessary to estimate the facial area of each frame of 2D images determined by the immersion method. 3D interplanetary items [1]. So, this research mainly focuses on different challenges that face recognition are to be overcome by effective use of deep learning models. An example of deep learning using deep neural network CNN and classifier of BiLSTM classes is also proposed. To get more clarity, try to follow some existing patterns of existing data to uncover the evolution of better performance. Below are the main conclusions of this research paper.

Novelty: Improved ensemble classifier performance in face recognition using three-bird optimization. The best solutions are achieved by combining the good habits of our birds and eliminating the worst habits. After training, the Ensemble classifier has many solutions, including both the best and worst solution, where Three Birds Optimization (TBO) is used to adjust the uniformity of individual elements. In this TBO, the best behavior of our birds is combined to achieve the best solutions by eliminating the worst chemicals. Tri bird is our bird with good behavior, crow bird has travel memory, its memory is replaced by passersby, passersby always know when looking for security updates. Sannio Optimization's features help find the best solution in a shorter time and complete the model faster. Tuning the classifier using TBO can improve performance and help achieve high acceptance rates.

Motivation: The TBO algorithm is designed to train decentralized DCNN and BiLSTM classifiers, which helps in obtaining suitable solutions from various options in the search space. Federated product classification combines the features and benefits of two advanced classifications to help make better facial recognition predictions. The use of technologies such as facial recognition in security monitoring is rapidly increasing, but the accuracy of facial recognition is not high. Therefore, the face in the video needs to be recognized with high precision. Therefore, a good face recognition model was developed using the TBO combination. The TBO algorithm is designed to train decentralized DCNN and BiLSTM classifiers, which helps in obtaining suitable solutions

from various options in the search space. Federated product classification combines the features and benefits of two advanced classifications to help make better facial recognition predictions. By building this model, a more accurate face prediction can be obtained, which is useful for real-time applications such as security analysis [24] [26].

2 Research Methodology

The architectural diagram described that face recognition systems [26] have an input face video database [19] by considering multiple parameters for detecting faces along with rest of the things. Primarily the input video gets pre-processed and the significant key frame selection process is the keynote main important research task needed to complete for good result. Due to right selection of frame, avoided wasted quality time and process speed for unwanted frames. The face detection method used proposed viola jones algorithm method, in which by direct tracing on colorful images it goes instead of grayscale image for more accuracy. Viola-Jones traces a square box to look at a face in the selected frame. For feature detection two important parameters are taken into consideration as noise and eyebrows are the vertical and horizontal features. From a selected frame each square box in white and black area, which depends on each size of pixel value. Then in order to achieve the good result, the most important features are extracted by new techniques ResNet101 and hybrid weighted texture pattern. The distributed Deep CNN classifier performance in face recognition is optimized by ECSO. The role of proposed optimization in designing the hyper/tunable parameter of the classifier to boost the global optimal convergence. Global convergence is largely used in the context of Iterative mathematical algorithms. It is usually defined as a sequence generated by the iterative algorithm converges to a solution point. Generally, adam optimizer is used for the classification purpose for deep learning training purpose. The proposed research method used novel concepts as social collie design instead of adam optimizer techniques. As per Architecture diagram the improved face recognition model used different phases, it takes input data in video-based format [19] [22] [27].

In Video there are numerous frames, so here for appropriate results from input video database changeling part as selection of appropriate frame for processing purpose. For such tricky situations a solution as a crossbreed detachment based significant structure selection. In this process, four different measurement methods are used: Bhattacharyya distance, Euclidean distance, distance measurement and distance measurement. The keyframe selection is dependent on the variation between the current frame and next frame, while compared with each other if maximum variation occurred then it will be selected. From the selected key frame, faces are detected in gray scale images using the viola Jones algorithm. This process will be carried out till the most relevant frame and carried out for feature extraction from detected faces which include two ways AlexNet and ResNet-101. The extracted features are provided to the ensemble model, which is effectively trained in the classifier. The ensemble model performance is enhanced by the tri-birds optimization algorithm, which well-tunes the hyperparameters present in a unique distinguisher through the exercise process. Therefore, the training images were tested against the query images using 10 different groups and based on which faces

were correctly classified [19]. Here the proposed system uses the video based input for appearance object acknowledgement tasks, which goes through numerous assessment and training videotapes are used [19]. Here have utilized 10 sample case video input for classes and training class video sequence.

2.1 Tri Birds Optimization:

In tri bird's optimization technique, the characteristics of gyps (vulture) played a major role. The foraging and orientation habits of African gyps are used as the basis for the tri-birds optimization; it has powerful operators while maintaining the balance of exploration and efficiency in solving optimization tasks. In a natural environment a huge number of vultures can be divided into two groups to divide this the algorithm calculates two fitness solutions the first solution is the leading and greatest predator then next one gets secondary finest predator. Here the cause for grouping these vultures is because each group has different abilities to find food and eat. Here requirement of devour meal indicates them to search the meal for hours to get cause to discharge over the hungry deception. Here the worst solution is the weakest and the hungriest gyps. The gyps try to keep their distance from the worst and find the best solution. The best solutions are the strongest and best gyps and the others try to approach the best gyps. The memorizing ability of the corvid (crow) birdie, get memorizes in traversing antiquity that is a argument of involvement, safeguards in capability of the through (sparrow), and the excellent behavior of gyps by removing the worst solutions to attain the better convergence rate with a better solution is utilized in the tri-birds optimization algorithm. Thus, this optimization is used to enhance the enactment of the collaborative prototypical which is used for expression acknowledgement [22-28].System architecture is given in figure 1.

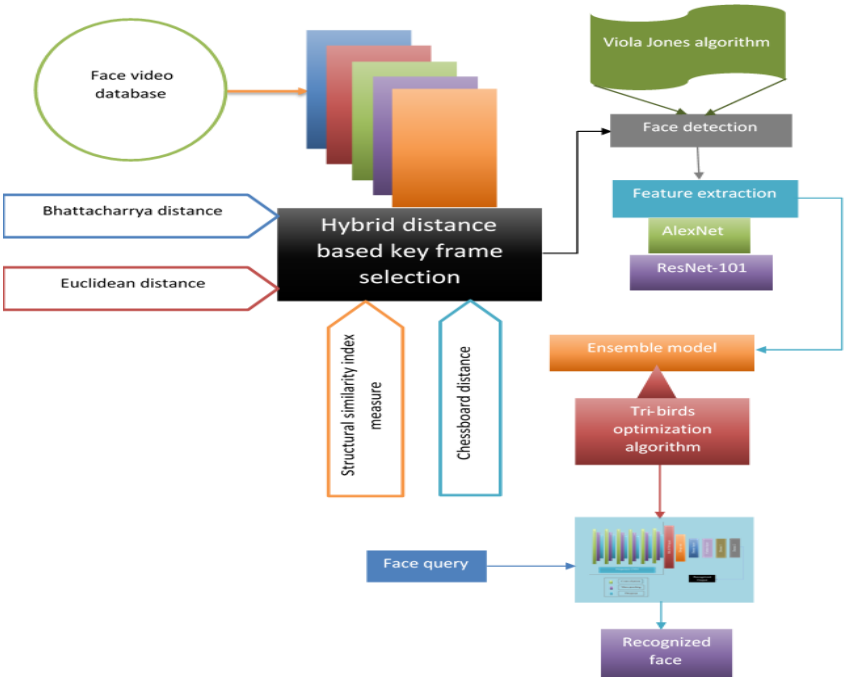

Fig. 1. System Architecture

2.2 Enhance Social Collie optimization

The ESCO is a hybrid optimization developed through combining the social hunting characteristics of coyotes [16] and intelligent behavior of guard dogs [17]. Technically, the aim of the optimization at enhancing the optimal convergence characteristics through improving the tendency towards global optimal solution with minimal convergence rate promotes the recognition performance of the classifier. The guard dogs have a number of significant characteristics, including being environmentally friendly, well-suited for physical activity, knowledgeable, intelligent, and available in useful types; as a result, humans can easily train the guard dogs. The guard dogs can live for 12 to 15 years, and the primary habit of a guard dog is guiding, and when a guard dog first begins the guiding process, they have a tendency to exert a lot of authority over the group. The Luna collie uses three different types of guiding strategies to get the best feedback and outcomes. The behaviors of the guard dog are used to achieve positive feedback by using an organizing and chasing technique. Feedbacks which include the positive and negative are dualistic feedback structures, in which the negative feedback is generated through the guard dog's detecting approach, and this detecting method, which is part of the guard dog, mainly helps to divert from the local optimum with fewer parameters. Due to its great fundamental properties, the proposed optimization algorithm's implementation is straightforward and is easy to estimate the best solution. Although there are many benefits, such as feedback execution, local optima recovery, fewer parameters, and simple execution, there are also some disadvantages, such as a

higher number of iterations and time consumption. These issues are overcome by incorporating the social hunting characteristics of the coyotes, which enhances the optimal convergence characteristics through improving the tendency towards global optimal solution with minimal convergence rate.

2.3 Hybrid distance based Key frame selection

Key frame selection criteria use multiple methods like the Bhattacharrya, Euclidean, SSIM, and chess board-based detachment techniques for effective structure assortment through various edges of the audio-video sequence. By comparing different frames with each other maximum variation by frame gets selected and further taken for processing. The Bhattacharrya distance is described as the calculation of the value among the two different histograms over the audio-video picture settings. The Bhattacharrya distanceD_1between the histograms$H_1$and$H_2$are determined by [19],

$$D_1 = 1 - \sum_{j=1}^{n} \sqrt{\mathrm{H}_1(j)\mathrm{H}_2(j)} \tag{1}$$

where, the compartments complicated of audio-video borders are characterized as$j$, among the values between of$1, \ldots\ldots, n$respectively. Euclidean distance measure is the estimation of space between two structures over the utilized audio-visual frames, here compares spending strength as well as the color of an individual feature. Typically, a Euclidean distance may result in a precise informative outcome, which is formulated as [19],

$$D_2 = \sqrt{\sum_{j=1}^{n-1} \left(\mathrm{H}_1(j)\mathrm{H}_2(j)\right)^2} \tag{2}$$

Simulated similarity measurement (SSIM) is a tool that calculates the similarity of adjacent images. If the other images are assumed to be ideal, the SSIM index can be used to evaluate the quality of the other images being compared.

The chessboard detachment metric computes over distance among point values using an 8-connected neighborhood as its basis. Pixels with touching edges or corners are separated by one unit. On the contrary, this metric assumes that one can move about the pixel grid just like a sovereign might in a chess board sport [19].

$$D_4 = max|\mathrm{H}_1(j) - \mathrm{H}_2(j)| \tag{3}$$

The planned mixture value-based important edge assortment is strong-minded exhausting the following calculation [19],

$$D = D_1 + D_2 + (1 - D_3) + D_4 \tag{4}$$

Here, the most important frame is selected as the beginning of a frame by using four different measurement values. Key frames are a shot or a drawing that designate the start and end of a transition, the distance between the keyframes is the length of time between the two keyframes. There are many methods to calculate the distances some examples are Bhattacharya which calculates the distance between the two histograms

of a video, Euclidean distance also calculates the distance between two histograms which gives results in a precise informative outcome, SSIM calculates how similar the neighboring images are to one another and in chessboard distance method it calculates the distance between the pixels in an 8-connected neighborhood as its basis in order to achieve these characteristics of these distance methods hybrid this distance methods into a hybrid distance based key selection technique which utilized To effectively select frames from different frames in the video sequence, these keyframes are selected based on the maximum variation present between the reference model and similar measurement system. It is used in facial recognition to select keyframes for face detection, these keyframes are selected as the starting point of a frame to compensate for the lack of a path. Parallel or serial mode.

2.4 Ensemble deep learning models:

In this paper use deep CNN and BiLSTM as ensemble models, Deep CNN is used for image classification for large datasets and in BiLSTM every component of an input sequence has information from both past and present in time which effectively increase the amount of information available at the network by ensembling these two can improve the performance for time series classification tasks and can yield high performance gain by extracting more features from the data. Three bird optimization algorithms are proposed to train a joint deep CNN and BiLSTM classifier that helps in obtaining suitable solutions from various options in the search space.

2.5 AlexNet and Resnet-101:

Here choose AlexNet because it contains more filters per layer and stacked convolutional layers. Each such filter is further connected with the activation function and this leads to faster training of models. AlexNet offered favourable characteristics in terms of speed, precision, and compactness, and so it was selected for this research. And choose Resnet-101 because it CNN which helps in 101 stratums bottomless. In networks which have a large number of layers can be trained easily without increasing the training error percentage. This research uses this as an addition to AlexNet to progress the expression acknowledgement result of the huge amount of face detection sets and the complicated surrounding scenario. There are other CNN models such as LeNet, VGGNet, GoogLeNet (Inception) etc. Here compared to LeNet, AlexNet can handle a greater number of classes, and as for VGG both AlexNet and ResNet are smaller in model size even though ResNet has many deep layers its size will reduce due to the use of global average pooling rather than fully connected series and get good overall result rate compared with VGG and GoogleNet the correctness rate is very less compared to Alexnet and ResNet. So, choose AlexNet and ResNet over any other CNN models.

3 Algorithm

Sr. No	Algorithm1: Tri-birds optimization procedure
a.	Proceed value: $k = (Postive\ values, \ldots\ldots, m)$
b.	Outcomes: Values of defrauds and suitability value
c.	Prime residents
d.	$G_k = \{k = 1,2, \ldots\ldots, m\}$
e.	Assessment of dupes
f.	Based on fitness
g.	Selection of dupes
h.	Consuming equation (6)
i.	Manipulation
j.	Rivalry for meal
k.	if$\|C\|$is ≥ 0.5
l.	dupes pleased
m.	else if
n.	Apprise the position using equation (8)
o.	Exploration
p.	if $t > \frac{m}{2}$
q.	Apprise the situation with help of step (10)
r.	else if
s.	Apprise the situation with help of step (11)
t.	Return
u.	$Gyps_{best1}$

4 Enactment Processes

The procedures deliberated for evaluating the enactment over Tri Birds-based deep CNN model are as follows [21],

4.1 Accuracy

The first criteria accuracy of the ESCO-based model is determined by the percentage of accurate face identification out of the total sample test faces of the same individual.

$$Accuracy = \frac{Percentageofaccuratelyidentifiedfaces}{Totalsampletestfaces} \quad (5)$$

4.2 Precision

The precision of the ESCO-based model is determined by the percentage of accurately identified faces out of the true and false identification of the same individual as positive.

$$Precision = \frac{Percentageofaccuratelyidentifiedfaces}{Trueandfalseidentificationaspositive} \quad (6)$$

4.3 Recall

The recall of the ESCO-based model is determined by the percentage of accurately identified faces out of the true identification as positive and false identification as negative of the same individual.

$$Recall = \frac{Percentage\ of\ accurately\ identified\ faces}{True\ identification\ as\ postive\ and\ false\ identification\ as\ negative} \tag{7}$$

4.4 F-measure

F-measure is the division of the product of result precision and recall to the summation of precision and recall in the face identification of an individual.

$$F_{measure} = 2\left(\frac{AB_{pre} \times AB_{rec}}{AB_{pre} + AB_{rec}}\right) \tag{8}$$

4.5 Dataset

For video face recognition, the Deepfake Detection Challenge [20] has been proposed as a strategy using various test videos, including 401 and 802 training videos. In this study, only 10 test video categories and training category videos were used to train the combined model.

5 Result and Conversation

Table 1 and figure 2 analyzes the performance of various face recognition models with only epoch 50 and retrieval time 500. Among many existing tools, the combination model based on the optimization of three birds achieves good performance in face recognition. Confirmation from the movie. The accuracy of the combination model based on the optimization of three birds reaches 97%, while the accuracy, recovery and f-measure values are 98.33%, respectively. The performance of various face recognition models is evaluated only 50 times and 500 times. Many of these methods are methods such as ANN, KNN, LSTM, CNN, Deep CNN, COA-based deep CNN, BCO-based deep CNN, deep CNN-BiLSTM. VSA-based deep CNN-BiLSTM, CSA-based deep CNN-BiLSTM, SSA-based Deep CNN-BiLSTM and ESCO-based Deep CNN were compared with the design model based on Tri-bird optimization based on accuracy, precision, recall and recall. F measure. Among many existing techniques, the TBO combination model achieves better performance in face recognition in videos. Figure 2 and table 1 analyzes the accuracy of the TBO combination model is 97%, and the accuracy, recall, and f-measure are 98.33%, respectively.

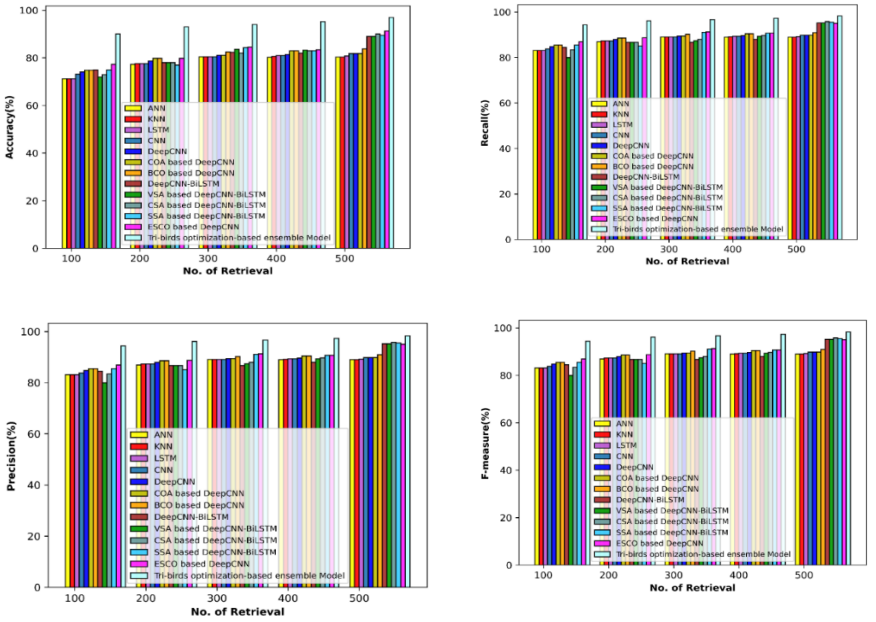

Fig. 2. Assessment among new and old methods

Table 1. Assessment among new and old methods

Approaches	Total repossessions 500/ Epoch 50			
	A %	P %	R %	F-Value %
ANN	80.30	88.97	88.97	88.97
KNN	80.30	88.97	88.97	88.97
LSTM	80.80	89.24	89.24	89.24
CNN	81.80	89.80	89.80	89.80
Deep CNN	81.80	89.80	89.80	89.80
COA based deep CNN	81.80	89.80	89.80	89.80
BCO based deep CNN	83.80	90.91	90.91	90.91
Deep CNN-BiLSTM	89.00	95.22	95.22	95.22
VSA based DCNN-BiLSTM	89.00	95.22	95.22	95.22
CSA based DCNN-BiLSTM	90.00	95.78	95.78	95.78
SSA based DCNN-BiLSTM	89.50	95.50	95.50	95.50
ESCO based DCNN	91.30	95.08	95.08	95.08

Tri-birds optimization-based ensemble model	97.00	98.33	98.33	98.33

6 Conclusion

Facial recognition is currently the most widely used technology in artificial intelligence, the integration of facial recognition technology into intelligent facial analysis is an important alarm and can be widely used. In this study, face recognition based on deep learning models is introduced. An integrated model based on the optimization of three problems is proposed to realize face recognition in videos by focusing on reality. Using hybrid distance-based keyframe selection, the most important keyframes are selected with four different measurement methods. Compared with face query, the composite model is optimized when classifying face images in video sequences. Accuracy was improved by 5.88%, and precision, recall, and f-value were improved by 3.31%. In the future, different models will be developed using new techniques to better recognize faces from videos.

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