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Design of Face Recognition AttendX for Recording Student Attendance Data Based on Artificial Intelligence Technology

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Abstract- AttendX is an online attendance platform created by Signy Advanced Technologies from India which aims to facilitate attendance in the scope of work and college. The way this system works is very easy by just registering so that the system can verify faces that have been registered for attendance. This application is designed with modern facial recognition technology that has developed rapidly, with this sophistication it can make it easier to detect faces on structured parts such as the forehead, cheekbones, eyes, and even the nose. When doing face detection, it is not only on one side but there are 3 (three) parts used, so that the results are more optimal, namely the right side, the left side, and the front side. In fact, to support the government's efforts to comply with the new normal regulations, the AttendX platform is designed to be able to detect faces if the user is wearing a mask. This study implements a real review of technological developments, especially making it easier to fill in attendance online, using face recognition technology, which is the latest development in detecting and verifying faces, introducing possible uses for aspects of use, by presenting a system called AttendX-Net facial recognition. The method used is ResNet as well as the Multi-layer feed-forward network to achieve the designed results. The use of LFW discovered by the University of Massachusetts researchers did not limit the number of facial recognition by using the identification data set from this study, including in-depth understanding techniques and explaining how machines work with the use of anti-spoofing making this a major challenge in facial care. Likewise, the Extended Mobile Net was used to solve a similar problem, in introducing a pipeline to reach the peak of the presence system implementation in different cases.

keywords: *AttendX, Face Recognition, Anti spoofing, Faiss.*

1. Introduction

Attendance is a very important aspect for every organization. Based on the presence aspect, technology is needed that can help the attendance process by providing AttendX as a step for advancing artificial intelligence-based technology [1]. With an attendance scanning model assisted by anti-spoofing to assist in facial care. Even the level and standard of education for manual time attendance

analysis for a month or a year can find wasted hours. In the case that occurs in class when filling in attendance data, it takes up to 10 minutes, if it is taken into account that in every 3 (three) courses followed in a day, 30 minutes are wasted in a day. The automatic attendance system is an attendance system without human interference that can be marked and avoids fraud in the form of absenteeism. So this research was made as a step in implementing the latest technological developments in education, as a test of the level of influence of artificial intelligence technology on recording student attendance data [2]. With the conditions in the new normal era, it is a reference for universities to reduce the spread of the COVID-19 virus [3]. This presence system involves a face detection and verification process as well as the latest technology to perform face detection and verification. In recording the presence of data, there are many aspects that arise as a result of this step, even the involvement of face verification as a certain step, such as the use of face recognition in different cases [4]. Is it enough to have a unique selection of deep learning and technology learning models for use cases? submission of different models once developed. A face that is used as proof of presence that is easily recognized by computers. After comparing the models, the ML classifier, and the distance function, we found a suitable result for the absence of faces [5].

The use of the LFW data set "Labeled Faces in the Wild" which is a facial photo database designed to solve facial recognition problems is not limited to measuring and comparing the performance of the proposed system on face-based presence in a concrete manner [6]. Based on this condition, technology education is needed that can help the presence process, one of which is the recording of artificial intelligence [7]. The attendance process with a scanning model using attendX, then assisted by data processing using applications can produce information that is more accurate and concrete than conventional methods [8]. Use of the LFW dataset was established and maintained by researchers at the University of Massachusetts, Amherst. The original database contained four sets of LFW images which were not the same as the three "inline" image types [9]. To form a data mix for face spoofing, in unequal lightning situations, the video is recorded 30 seconds then replays the same video facing the phone to the desktop after this process gets two real and fake videos [10].

The residual review of this paper is in part 2 presenting related research in this field, section 3 defines the model architecture used, section 4 describes the results and discussion. Late in section 5 we present the conclusions and scope of the future [11].

2. Research methods

The domains used in facial recognition and verification are predominantly as per the most recent literature. The Alexnet architecture used in the DeepFace method obtains an accuracy of 97.35% with softmax as a loss function with the Facebook training dataset (4.4M, 4K) [12]. Alexnet architecture using the Deep ID2 method obtains 99.15% accuracy with contrastive loss with the CelebFaces + training dataset (0.2M, 10K) [13]. Deep ID3 using VGGNet-10 architecture obtained 99.53% accuracy using contrastive loss with training dataset CelebFaces + (0.2M, 10K) [14]. The GoogleNet-24 architecture obtains 99.63% accuracy used in the facenet method with triplet loss on Google dataset (500M, 10M) [15]. Baidu uses CNN-9 architecture which gets 99.77% accuracy, triplet loss on the baidu dataset (1.2M, 18k) [16]. VGGface uses the VGGNet-16 n architecture to obtain an accuracy of

98.95%, triplet loss on the VGG face dataset (2.6m, 2.6K) [17]. Light-CNN using light CNN architecture obtains 98.8% accuracy, softmax loss on the MS-Celeb-1M dataset (8.4M, 100K) [18]. Center Loss using Lenet + -7 architecture gets 99.28% accuracy, center loss on CASIA-WebFace, CACD2000, Celebrity + (0.7M, 17K) dataset. L-softmax using VGGNet-18 obtained an accuracy of 98.71%, L-softmax on the CASIA-WebFace dataset (0.49M, 10K) [19]. Range Loss using VGGNet-18 architecture obtains an accuracy of 99.52%, range loss on the MS-Celeb-1M dataset, CASIA-WebFace (5M, 100K) [20].

L2-softmax using ResNet-101 architecture obtains 98.8% accuracy, softmax L2 on the MS-Celeb-1M dataset (3.7M, 58K). Normface using the Resnet-28 architecture obtains 99.19% accuracy, contrastive loss on the dataset (CASIA-WebFace (0.49M, 10K) [21]. CoColoss using the CoCo loss function obtains 99.86% accuracy on the MS-Celeb-1M dataset (3M, 80K) . The vMF method using ResNet-27 obtained 99.58% accuracy, vMF loss on the MS-Celeb-1M dataset (4.6M, 60K) and Marginal Loss using ResNet-27 obtained 99.48% accuracy, marginal loss on the dataset (MS- Celeb-1M (4M, 80K). Sphere Face using ResNet-64 obtained 99.42% accuracy, A-softmax on CASIA-WebFace dataset (0.49M, 10K) [22]. CCL using ResNet 27 got 99.12% accuracy, center invariant loss on the training dataset (CASIA-WebFace (0.49M, 10K). AMS Loss ResNet-20, AMS Loss on training dataset (CASIA-WebFace (0.49M, 10K). Cos Face using ResNet-64 gets 99.33% accuracy, cosface on dataset CASIA-WebFace training (0.49M, 10K). Arc Face using ResNet-100 obtained an accuracy of 99.83%, arc face loss on the MS-Celeb-1M dataset (3.8M, 85K) [23]. Ring Loss using ResNet-64 dataset obtains 99.50% accuracy, Ring Loss on MS-Celeb-1M (3.5M, 31K).

3. Findings

In this paper, it is found that the involvement of face alignment is the best combination, classified embedding based on technology that is created consisting of objects. Use of face recognition In real time, the color intensity during face input may be misaligned, so use face alignment techniques to get accurate results [24]. The alignment of faces is an original landmark process that has been influenced before. Python script is designed as a face coordinate point so that the eye is under the horizontal axis [25]. Face recognition which helps the facial recognition process [26]. An important step of feature vector extraction from aligned surfaces, by training on the LFW dataset and obtaining a 128-d feature vector as support for this study [27]. Face recognition is one of the biometric recognition methods, the way face recognition works includes face detection and classification [28]. The output layer is a collection of test results on the neural network. Neural network is an Artificial Intelligence method on a Multi-Layer Neural Network that has multi-layer characteristics on the connected layer nodes, this model is used in the neural network development system because it has good performance in terms of accuracy.

The table shows the results of testing the output layer on the neural network.

Layer Name	Output Size	18-Layer	34-Layer	50-Layer	101-Layer	152-Layer

Conv1	112x112	7x7,64, Stride 2				
Conv2 x	56x56	3x3x Max Pool, Stride 2				
		3x3,64 X2 3x3,64	3x3,64 X3 3x3,64	1x1,64 3x3,64 X3 1x1,256	1x1,64 3x3,64 X3 1x1,256	1x1,64 3x3,64 X3 1x1,256
Conv3 x	28x28	3x3,128 X2 3x3,128	3x3,128 X4 3x3,128	1x1,128 3x3,128 X4 1x1,512	1x1,128 3x3,128 X4 1x1,512	1x1,128 3x3,128 X8 1x1,512
Conv4 x	14x14	3x3,256 X2 3x3,256	3x3,256 X6 3x3,256	1x1,256 3x3,256 X6 1x1,1024	1x1,256 3x3,256 X23 1x1,1024	1x1,256 3x3,256 X36 1x1,1024
Conv5	7x7	3x3,512 X2 3x3,512	3x3,512 X3 3x3,512	1x1,512 3x3,512 X3 1x1,2048	1x1,512 3x3,512 X3 1x1,2048	1x1,512 3x3,512 X3 1x1,2048
	1x1	Average Pool,1000-d fc, Softmax				
FLOPS		$1.8x10^9$	$3.6x10^9$	$3.8x10^9$	$7.6x10^9$	$11.3x10^9$

Table 1. Convolutional kernel and output size during testing

In the convolutional kernel, it is used to extract features from the input image which produces output data according to data information. The way the output layer works is shown in Table 1 with the kernel layer size which refers to the filter mask width level with the maximum kernel size, after entering the input layer the data will be processed and forwarded to each layer to the output layer, the results of the output layer size will be compared to each layer. The difference in the output of the frame will amplify the return of the final output according to user requirements. The table provides a comparative analysis of the various approaches used during the test.

Figure 2. AttendXNet's face embedding illustrates the process of creating a face embedding from aligned input.

Storage of face embedding in the database there are two categories of approaches in the attendance task to register users shown in figure 2. Registration of single images or with multiple images at different angles, annotated in Figure 3.After extraction of feature vectors from input samples, the database defense is useful for storing features [29]. Multi-layer Neural Network is used in AttendeXNetV1 as a learning from feature set database [30].

Figure 3. AttendeXNetV1, module version1

The latest testing step uses other machine learning models such as Support vector machine, k-nearest neighbors (KNN), Decision Tree, and classifying Naive Bayes. As well as testing in IT workspaces and colleges [31]. for facial pipelines most suitable Multi-layer Neural Networks [32].

As material for studying the feature set of AttendeXNetV's Faiss Similarity Search Database. in this context it is the most efficient similarity search that is very important. The accuracy of

AttendeXNetV2 is comparable to that of AttendeXNetV1. To test the use of Faiss tested different IT workspaces as well as colleges [33]. That way one can find the similarity of Faiss more quickly than layered Artificial Neural Networks.

Figure 4. AttendeXNetV2, module version2

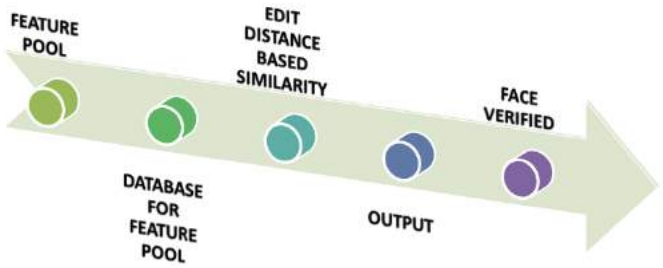

Figure 5. AttendeXNetV3, module version3

AttendXNetV3 uses similarity based edit distance for learning, in Figure 5 it can be shown as a feature set from the database. In testing this module in different workspaces and colleges with distance editing [34]. The findings at edit distances are useful and concrete when compared to Manhattan distances. AttendeXNetV1 and AttendeXNetV2 are more accurate than AttendeXNetV3 [35].

The table is the result of testing the use of photos and videos on MobileNet.

Type	Filter Shape	Input Size
Conv/s2	3x3x3x32	224x224x3
Conv dw/s1	3x3x32 dw	112x112x32
Conv/s1	1x1x32x64	112x112x32
Conv dw/s2	3x3x64 dw	112x112x64
Conv/s1	1x1x64x128	56x56x64
Conv dw/s1	3x3x128 dw	56x56x128
Conv/s1	1x1x128x128	56x56x128

Conv dw/s2	3x3x256 dw	56x56x128
Conv/s1	1x1x128x256	28x28x128
Conv dw/s1	3x3x256 dw	28x28x256
Conv/s1	1x1x256x256	28x28x256
Conv dw/s2	3x3x256 dw	28x28x256
Conv/s1	1x1x256x512	14x14x256
5x Conv dw/s1 Conv/s1	3x3x512 dw 1x1x512x512	14x14x512 14x14x512
Conv dw/s2	3x3x512 dw	14x14x512
Conv/s1	1x1x512x1024	7x7x512
Conv dw/s2	3x3x1024 dw	7x7x1024
Conv/s1	1x1x1024x1024	7x7x1024
Avg Pool /s1	Pool 7x7	7x7x1024
PC/s1	1024x1000	1x1x1024
Softmax/s1	Classifier	1x1x1000

Table 6. MobileNet architecture

One of the main attacks in this design could be to deceive the attendance system by using unrelated photos or videos, namely print and video aggression [36]. The search for a solution found a gesture-based technique to solve this problem, but this technique does not work very well for video aggression. Likewise, the user must perform certain gesture actions such as blinking an eye. implementing this deep learning base technique has the advantage for users to improve results and better experiences. The application of face anti spoofing is done first using a python script by changing the size randomly [37].

The results of different experiments can be found that the current MobileNet architecture does not match the standard results. We added three layers to the existing network and tested it in different cases. Extended-MobileNet has a 98% model accuracy rate. In conducting experimental experiments using GTX 2080 graphics, it is highly recommended to use a GPU version that has efficient and effective performance to get better results [38].

4. Results and Discussion

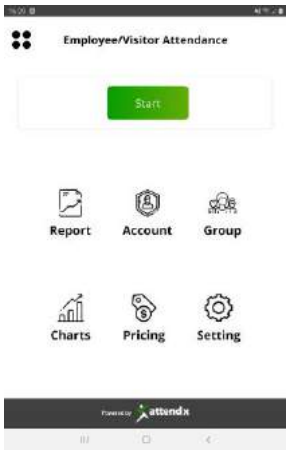

Figure 7. Signy Advanced Technologies application for onboarding

Signy Advanced Technologies' mobile application development carried out the testing of the proposed method to increase users [39]. The first step taken for onboarding. The depiction of the first layer of the application is shown in Figure 7. which requires the user admin to start the application once. After that, scan the user's face directly with the face detection module.

After face detection, to be implemented on the same input server will be moved to the two APIs. The initial stage of the Extended-MobileNet API "Application Programming Interface" is an interface programming application that will extract features based on input images and classify them concretely and spoof. As a security measure when an intruder tries to fake an identity the system automatically saves the image. The second step, AttendXNet API will take faces and extract the 128-d vector according to the AttendeXNetV1, AttendeXNetV2 and AttendeXNetV3 architectures to be verified. For facial care using the AttendeXNet version in the test analysis. The use of 3 (three) variants of AttendeXNet, as the most suitable method can be found in multi-layer Neural Networks and Faiss. Selection of Faiss in the last section because it is accurate and relatively fast.

Figure 8. User Check-in using Signy Advanced Technologies

Figure 8 shows the process of using Signy Advanced Technologies which successfully checks in by detecting faces.

The proposed testing method for group attendance can be solved by using an IP camera based to take the input shown in Figure 9. On the application of the context in the classroom [40]. The input will be sent after a fixed interval to the AttendexNet API.

Figure 9. Group Attendance

After the XNet API Attend receives input as shown in Figure 9. and will be returned in the form of face id data, number of faces, and concretely recording status [41].

The table shows student attendance data when doing attendance (output XNet).

Start	Total Male	Total Female	Total True Overall	Total False Overall	Total Not Detected	Total Trial	Target
05/8/2020	17	32	1202	352	210	1764	1000
			68%	20%	12%		

Total Successfully Weared The Mask	Successful Total Dont Use a Mask	Total Not Detected Using Mask	Not Detected Total Does Not Use Mask	True Total Male	True Total Female	Wrong Total Male	Wrong Total Female	Total Was Not Successful Not Using The Mask	Total Does Not Work Using The Mask
497	705	147	63	416	786	119	233	114	238
56%	80%	17%	7%	68%	68%	34%	66%	13%	27%

Table 10. AttendX Test Results

The table above shows the results of the AttendX trial version 1.28 which was carried out for 13 days from 5 to 18 August 2020 [42]. In this trial, 49 people were tested, consisting of 17 men and 32 women. Attendance was conducted 1764 times out of the targeted 1000. From 882 absenteeism trials wearing masks, the success rate reached 56%. And of the 882 trials without a mask, the success rate was 79%. The total percentage of correct men was 78% of the 612 trials and women was 77% of the 1152 trials. Overall, from a total of 1764 tests conducted, there were 1202 successes, with an accuracy rate of 68%. Between wearing a mask and not wearing a mask, between men and women in fact there is still a fairly large error. It was found that there was a significant difference between wearing a mask and not wearing a mask, and there was no significant difference between men and women.

5. Conclusion

The design of artificial intelligence through AttendX, Signy Advanced Technologies creates a breakthrough in artificial intelligence to record attendance data of students who are considered capable of avoiding attendance fraud. In the AttendX Trial test version 1.28 for 13 days from 5 to 18 August 2020. In this trial, 49 people were tested, consisting of 17 men and 32 women. Attendance was carried out 1764 times out of the targeted 1000. From 882 absenteeism trials wearing masks, the success rate reached 56%. And of the 882 trials without a mask, the success rate was 79%. The total percentage of correct males was 78% of 612 trials and females was 77% of 1152 trials. Overall, out of a total of 1764 tests performed, there were 1202 successes, with an accuracy rate of 68%. The conclusion between wearing a mask and not wearing a mask, the error is still quite large. Between men and women the error is still quite large. There is a significant difference between wearing a mask and not wearing a mask, there is no significant difference between men and women. The target will be tested to ensure that the error rate is still large enough. Aiming without obstacles in the learning process and making it easier for teachers and students [43].

In the future, requires improving the system data set by collecting more anti-spoofing test samples of faces in different lighting conditions. Systematic learning architecture on deep technology is developing very fast, this will help to design efficient and robust systems. for now it will be very useful for the purposes of the scope of work and universities. and facilitate the recording of student attendance data more easily [44].

This study proposes AttendXNetV1, AttendXNetV2 and AttendXNetV3 to be carried out effectively to perform facial verification tasks for artificial intelligence-based attendance data security. Increased use of embedding is expected to combine identified classifiers and similarity measurements to produce pipelines for real-world applications, as well as further developments so that they can achieve 99% success before going public. The results of this study are expected to provide a step forward in artificial intelligence-based technology as an alternative in academic activities as well as the use of technology that must be improved to face a growing era.

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