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Smart Attendance Monitoring System Based on Kernel Principal Component Analysis and Singular Value Decomposition.

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Abstract: Advances in programming face recognition have made numerous impacts in the evolving scene. A PC framework in my face recognition project will want to locate and recognize human faces in images or recordings captured by an observation camera quickly and precisely. Various calculations and procedures have been developed for working on the presentation of face recognition, but the idea to be implemented here is Deep Learning movements. Today, recording someone's presence is the most important thing for any organization. Someone's attendance at an office or association indicates that they are fulfilling their obligation to attend. This paper explains how to track participation in a simple and effective way. Face recognition provides a precise framework for dealing with ambiguous situations like fake participation. This framework uses an Open CV face recognition library for facial distinguishing proof and participation storage (Python). The picture is captured by the camera and sent to an information base organizer, which contains pictures that distinguish faces and calculate participation.

Keywords: OpenCV, Numpy, DLIB, Cmake, Face Detections, Face Recognition

I. INTRODUCTION

Face acknowledgment, we believe, can help individuals confirm their collaboration by incorporating these features. Face recognition is extremely essential in today's electronic environment. A few segments may be reliant on development to determine participation at this time. Nonetheless, some people engage in traditional techniques that consume a significant portion of their day.[8] Face recognition is perhaps the most heavily focused area of the PC vision development, with new approaches and enabling outcomes being introduced on a regular basis. Face recognition techniques are primarily divided into two types: based and sweeping. A face acknowledgment framework is an excellent way to address these concerns. Students can also be cautious without worrying about completing desk work for their investment and losing some of the information provided by the instructor. [2] As far as the educator is concerned, everything appears to be in order with the structure saving all of the students' investment registrations for future reports. The Automated Attendance System (AAS) is a program that uses face recognition technology to determine whether or not a student is present in the homeroom. Because the presence of students cannot be established by continuously recording their appearances on a large-screen video, the system should detect the presence of all students in the review lobby. It has the particular benefit of being the only biometric that can discern proof from a distance without subject involvement of consciousness. A finger impression is a suitable option for clients who do not want to contact the sensors with their fingertips. It's probable that it won't hurt any real biological components, like the retina or iris. The getting method is likewise complicated in the iris recognition framework. Eyelids, lashes, spectacles, contact focal points, eyes, and hair should all be occluded. [5]

1. Use a systematic strategy.
2. A wonder-based strategy

The essence of a single person will be used to determine cooperation. Face recognition is becoming increasingly common these days, and it is widely used. In this research, we offer a system that recognizes student characters from live continual videos of homeroom and stamps investment if the recognized face is found in the database. Unlike traditional techniques, this new system will necessitate considerable investment. [1]The main goal is to develop a strong and secure facial recognition technology for individual approval, as well as to evaluate the introduction of the ideal construction by comparing it to other existing systems determined from the manual and other traditional

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Participation structure strategies. Face recognition software has been employed in the complex as well as simple security applications. In today's society, a biometric identification system is an apparent method for identifying people's identities. There are several sources for high-resolution photos. [3]The system, on the other hand, has difficulty comprehending the face image since it is unfamiliar with its semantics. [8] It is not an impediment to mobility. Furthermore, the registration or enrolling procedure is straightforward and just takes a few seconds. Individuals have little to no opportunity to re-registering. Changes in posture and lighting, aging, and cosmetics will all have an impact on its efficacy. Spectacles and the inability to tell the twins apart despite these misgivings, various application areas have been found, such as attendance.[4]

II. LITERATURE REVIEW

B.J.Teoh et.al. [1] Used an AI approach to investigate the possibility of two developments, namely Student Participation and Feedback Framework. As a result, this structure senses the students' performance and keeps track of their records, such as cooperation and contribution in disciplines like Science and English. The student's attention can be accessed by seeing his or her expression. Input is obtained by observing interest subtleties as well as experiences in the student's indications. As a result, each establishment has its own approach. Some people still deal with checking investments using paper records, while others use computers.

A.Goh et.al. [2] used a robotized participation framework based on face recognition is a biometric framework that enlists the participation of every understudy present in a class by recognizing and distinguishing their appearances in general, and then sending this recorded data to a server gadget that can register the participation of every understudy, resulting in improved educator and understudy efficiency and results, as well as better time utilization. Face recognition and location segment, recognize a face in a photograph shot by the camera and yield and store the photograph. Photographs of understudy faces that have been physically enrolled in the record with their names and ID codes are recognized by the component.

B.Scholkopf et.al.[3] used an Attendance Management System Keeping up with participation using Image Processing is critical and necessary in every organization for checking the exhibition of understudies. In this manner, each establishment has its own strategy. Some are using the old paper or record-based approach to gauge participation, while others have embraced techniques for programmed participation using biometric strategies. For this reason, there are numerous programmed techniques available, such as biometric participation. This plethora of strategies also sits idle because understudies must draw a line in order to contact their thumb on the checking device. According to his paper, the framework should consider participation as a result of consistent perception. Continuous perception aids in evaluating and improving the participation exhibition. To gain participation, the positions and faces of the understudies in the homeroom are photographed.

B.Ripley et.al. [4] Proposed a framework for robotized participation. The model focuses on how face recognition combined with Radio Frequency Identification (RFID) recognizes approved understudies and considers how they enter and exit the homeroom. Every enrolled understudy has a valid record kept by the framework. In addition, the framework keeps track of each and every understudy enrolled in a specific course in the participation database. The creators devised and implemented an iris biometrics-based participation framework. The participants were first approached to enlist their subtleties as well as their unique iris layout. The framework naturally took class participation at the hour of participation by capturing the eye picture of each participant, perceiving their iris, and looking for a match in the created data set. It was a web-based model.

Bezdek et.al. [5] Proposed a participation framework. The framework was implemented using Viola-Jones and Histogram of Oriented Gradients (HOG) calculations, as well as a Support Vector Machine (SVM) classifier. The creators considered various continuous situations such as scaling, enlightenment, impediments, and posture. The quantitative analysis was carried out in MATLAB GUI and was based on Top Signal to Noise Ratio (PSNR) values. Looks at the Receiver Operating Attributes (ROC) bend to find the best facial appreciation calculation. In light of the research conducted in this paper, the ROC curve revealed that Eigenface achieves better results than Fisher's face. The framework that used Eigenface calculation achieved a precision rate of 70% to 90%.

Blanz et.al. [6] Use a method for understudy participation in homeroom using a face recognition method (DCT). These calculations were used to remove the elements of the understudy's face, which were then arranged using the Outspread Basis Function (RBF). This framework achieved an accuracy rate of 82 percent. Face and head discovery for a constant frame reconnaissance framework using four directional highlights (FDF) and direct discriminate investigation has been proposed. FDF is one of the most effective features for recognizing designs. The FDF incorporates the info picture's four directional highlights (vertical, flat, and two diagonals). The proposed technique achieved a location display of around 10 frames per second; however, execution requires significant improvement.

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Boles et.al. [7] Use method for the ear is presented to the point where a photograph of the understudy's ear is taken and stored on the PC. This image demonstrates edge recognition. A reference line for different highlights is recognized from this distinct edge. These extracted highlights are saved as vectors in an information base, with each vector corresponding to a specific picture in the database. The test picture's element vector is compared to those in the vector data set. People's records and highlighted vectors are used for database creation and maintenance, with the goal of correlation and navigation. MATLAB and ODBC Drivers are connected, and a match is made.

Bradski et.al. [8] Provides a continuous mail framework (MASYS) that sends a continuous mail conveyance warning to the client, replacing the standard method of checking sends. When the sends are sent, this computerized framework can respond based on the sensor states. To incorporate this into our task, we propose a similar continuous alarm framework that is computerized to send messages to the has or educators in regards to the understudies' infringement of the current principles that were caught during web delegating. that provide insights into a productive method for performing timestamps to obtain exact results if there should arise an occurrence of distant patients using HL7 timestamp organisations to distinguish between local time (+0000) and widespread facilitated time or organization time convention time when no geographic time region is suggested (0000).

Jitendar et.al. [9] used the Viola-Jones calculation for face location because it is efficient, quick, and reliable for long-term use. This framework, which is based on face recognition and acknowledgment calculations, recognizes the understudy as soon as he walks into the study hall and imprints his participation by remembering him. Only two people are allowed to enter at a time, according to the rules. The face has been addressed using Head Part Analysis (PCA). Furthermore, SVM was used for highlight extraction. The framework they've devised is based on a Raspberry Pi running the Linux Operating System and a servo engine, with the goal of opening a model way for the alleged understudy to enter the class. Unlike the framework depicted in this paper, which anticipates students to physically enter a class through a door that opens based on face recognition, our framework is designed to work entirely online.

III. RESEARCH GAPS

1. Previous studies may have lacked occlusion quality in face photos, making it harder for the system to function properly.
2. Varying images of the same person are being gathered with different poses, emotions, and lighting, which dramatically increases Space Complexity.
3. In prior systems, aging had a significant impact, which is a significant disadvantage for image processing systems.
4. Image noise is not effectively removed from older photos.

IV. PROBLEM FORMULATION

The proposed structure captures the essence of each understudy and stores it in a database for their participation. The essence of the understudy should be captured in such a way that all of the components of the understudy's face are identified, as well as the understudy's seating and stance. Because the framework records a video and through further handling stages, the educator's face is perceived and the participation information base is refreshed, there is no need for the educator to physically evaluate participation in the class. When students attend classes, they can learn more and understand lectures better. Listening expands one's knowledge. Participating in a particular meeting might provide a person with information on the meeting's theme. It has been proved that students who do not attend their lectures on time have lower academic achievement than those who do. However, face recognition software can be vulnerable to false positives and misleading negatives, inconstant lighting, facial obstruction, and drastic changes in appearance. Because of its non-typical nature, a prominently visible face acknowledgment framework can increase executive participation. When compared to other types of biometrics, the facial recognition biometric framework is chosen because of its non-inherent character.

V. METHODOLOGY

Kernel Principal Component Analysis: The bit procedure is used to perform a known interpretation of (x). PCA is strength for a strategy with applications in areas such as picture PC vision reduction. It is a method for recognising data designs and displaying information in a way that highlights similarities and differences. Because designs in data can be difficult to find in high-layered data without the help of graphical representation, PCA is a useful information investigation tool.

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The formula for KPCA is given below:

$$\frac{1}{N}\sum_{i=1}^{N} \mathbf{x}_i = 0 \quad \textbf{(1)}$$

$$C = \frac{1}{N}\sum_{i=1}^{N} \mathbf{x}_i \mathbf{x}_i^{\top} \quad (2)$$

$$\lambda \mathbf{x}_i^{\top} \mathbf{v} = \mathbf{x}_i^{\top} C\mathbf{v} \text{ for } i = 1, \ldots, N \quad (3)$$

$$\lambda \mathbf{v} = C\mathbf{v} \quad \textbf{(4)}$$

This technique was implemented. Diminish for face recognition, the Dimensionality (PCA) approach, which is a black box procedure, is used. PCA is a traditional direct space technique that is suitable for utilitarian structure-based applications such as computerised reasoning, sensor combination, PC and control hypothesis, transportation, and so on. Face recognition has a few applications. Among the most helpful applications are population checks, moving photographs, ordering, individual character (for example, a driver's permit), entrance security, and various workouts. The technology gathers facial data and projects it onto the subject's face. The framework determines the distance between it and every single hidden sign of failure.

Singular Value Decomposition: In a very un-square sense, the SVD is the perfect system disintegration because it compresses the greatest sign energy into as few coefficients as possible. Singular value decay (SVD) is a strong and persuasive approach for separating a system into several clearly free pieces, each with its own energy responsibility. Singular worth rot (SVD) is a numerical approach for inclining punch organisations in numerical analysis.

The formula for SVD is given below:

$$A = U\sum V^{\top} \quad (5)$$

$$A = U\Sigma V^{T}, A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ -1 & 1 \end{bmatrix} \quad (6)$$

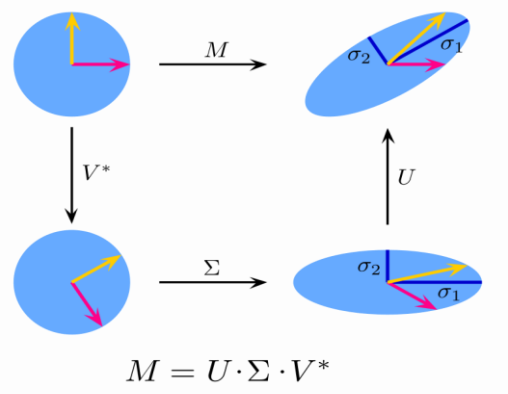

Figure 1: The pictorial representation of SVD

Face Recognition Operations:

1. **Face Recognition:** The process of facial recognition begins with the human face and the basic facial traits of the subject to be recognized. When we think of a human face, we usually think of the three most important features: the eyes, nose, and mouth. For facial recognition technology to operate, it must first grasp what a face is and how it appears.

2. **Face Extraction:** The face is then photographed and examined. Most facial recognition relies on 2D photographs rather than 3D images since they are easier to compare to the informational collection. Facial recognition software will look at the distance between your eyes and the condition of your cheekbones. These vacation spots serve the aim of identifying each face in the database.

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3. **Face Representation:** It is now entirely based on a mathematical formula, and the face components have been replaced with numbers. This numerical code is deciphered using a face print. Similarly to how everyone has a unique finger print, everyone has a unique facial print.

4. **Face Matching:** The code is then compared to a database of other face prints. This database contains images that may be compared and recognisable verified. The construct then looks for a match in the available data collection for your demanding components. It either sends the match plus more information, such as names and addresses, or it uses data stored in an individual's informative index.

VI. PRESENT WORK

- **Picture Quality Metrics**: Picture Metrics is a provider of face action programs and services to the exceptional perceptions industry. The Image Metric unique face adoration system is a Marker-less development catch innovation that captures an entertainer's performance and develops a 3D vivified model directly from raw images.

1. **Mean Square Error**: The pixels of each of the two images A and B will be similar at the square of qualification between A and B, which will then be totalled up and separated by the number of stars. It's also possible to make a mistake when analysing contrasts by looking at the E for the blunder, which is known as a mean squared distinction.

$$MSE = \frac{1}{NxM}\sum_{i=0}^{N-1}\ \sum_{j=0}^{M-1}\ [X(i,j) - Y(i,j)]^2 \tag{7}$$

2. **Structural Similarity Index Measure:** This is a method for predicting the obvious notion of automated TV and consistent with life pictures, as well as other high-level pictures and accounts. SSIM is software that determines the similarity of two images. The SSIM record is a finalized reference measure; often, the judgment or assumption for picture quality is based on an uncompressed or mutilated reference image.

$$\mathrm{SSIM}(x,y) = \frac{(2\mu_x\mu_y+c_1)(2\sigma_{xy}+c_2)}{(\mu_x^2+\mu_y^2+c_1)(\sigma_x^2+\sigma_y^2+c_2)} \tag{8}$$

3. **Peak Signal-To-Noise Ratio:** This is a plan term for the ratio of a sign's maximum potential power to the power of contaminated turmoil that impacts the commitment of its depiction. Because many signs have an extremely broad range of force, PSNR is sometimes given as a logarithmic value on a decibel scale. PSNR is frequently used to check the quality of re-creating pictures and recordings that have been incorrectly packed.

$$PSNR = 10\log_{10}\left(\frac{R^2}{MSE}\right) \tag{9}$$

- **Image Noise Removal**: Clamour handles unwanted information that degrades image quality. Noise is also an irregular variation in image power that appears as grains in the image. Noise indicates that pixels inside the image have varied power esteems rather than the correct pixel values. The concept of identifiable proof cycles produces upheaval, which has a variety of designs and reasons.

1. **Averaging:** After applying a convolution system with a normalized box channel to the picture, the centre value is discovered. In convolution activity, the channel or spot is slid over an image, and the average of the vast number of pixels is located under the piece region, and this type is replaced with the picture's core portion. The smoothness of a picture is determined by the size of the component. If the Kernel size is too large, the little component of the image will be lost. Regardless, if the component size is too little, it will not be able to suppress the noise.

2. **Gaussian Smoothing:** Gaussian smoothing is based on the notion of using this 2-D allocation as a 'point-spread' capability, which is accomplished by convolution. Because the image was saved pre-emptively.

3. **Median:** The window or piece is usually a typical square; however it might be any form. The centre channel is a non-direct high-level isolating approach for removing noise from a photograph or sign. This type of noise reduction is a common pre-treatment strategy for reducing the long-term repercussions of subsequent treatment (for example, edge acknowledgment on a picture).

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4. **Bilateral:** Sifting is perhaps the most important aspect of image management and PC vision. In the broadest sense of the term "filtering," the value of the isolated image in a particular location is one of the benefits of the data picture in a small neighbourhood of a comparable region. Gaussian low-pass isolating, for example, depicts a weighted average of neighbouring pixel values.

Pseudocode:

- **Step 1:** The first step is to configure the framework in OpenCV and Python.
- **Stage 2:** The next step is to import the images of various persons in the data set envelope. Each person just requires one image.
- **Stage 3:** To make the computation work, press the Run button.
- **Stage 4**: Place your perfect image in front of the camera. You may use your phone to show images to the sensor, or a simple snapshot.
- **Stage 5:** If the computation determines that the individual in front of the sensor is equal to the individual in the information base organizer, it will gradually maintain their involvement in a success sheet.
- **Stage 6:** Nothing will happen if the individual is not in the database organizer, and no involvement will be recorded.
- **Stage 7:** Finally, all involved will be tracked gradually, with names and timings recorded on a progress sheet.

Computer Vision is a course that teaches PCs how to work with images. It is in charge of comprehending digitized visuals or recordings to a high degree. We should utilize a typical representation of the equivalent to model a functioning computation for an Image Processing use case. ML algorithms demand a significant amount of high-quality data to learn and anticipate incredibly exact results straight immediately. As a result, we'll need to ensure that the photos are handled, explained, and adhere to ML image handling standards. The properties depicted in the image below are identical. Several sorts of studies have looked into things like edge mapping, intensity, and lighting. Furthermore, humans can recognize faces in the presence of occlusions, demonstrating that face recognition can be based on a (selected) subset of facial components.

This is why researchers are striving to recognize faces just based on their eyes. Face biometrics are measured using a variety of face recognition technologies. Security systems, authentication, access control, surveillance systems, Smartphone unlocking, and social networking services all make excellent use of facial recognition. Face recognition, unlike fingerprints or other security measures, does not require any physical contact, making it a quick, automatic, and seamless verification experience in the post-COVID era.[4] Businesses require both secure and fast technologies in an era of cyber attacks and advanced hacking tools. Facial recognition allows you to verify someone's identity quickly and easily. Security software and facial recognition software are generally compatible. The matrix must be constructed in such a way that the matrix's most significant section may be promptly retrieved for further calculations. The Singular Value Decomposition (SVD) is useful in this instance. This sophisticated regression approach aids in the resolution of complicated problems in the field of environmental sciences. This approach may also be used to find significant solutions for a smaller set of values.

However, the smaller number of values masks the huge diversity contained in the original data. Data in the geophysical and atmospheric sciences indicates significant geographic relationships. A Singular Value Decomposition study confirms these associations and yields findings for a more concise illustration. The graphic below shows SVD divided into three matrices First and foremost; we must enter the individual's data into the database. To do so, we'll need to give the photo a name. Now we need to photograph the individual using the webcam or any additional cameras that are available, such as the laptop webcam we utilized here. The data are subsequently saved in a database. The camera begins recording and captures a picture in order to retrieve the findings from the saved database. It tracks attendance on an excel sheet in real-time.

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Flowchart

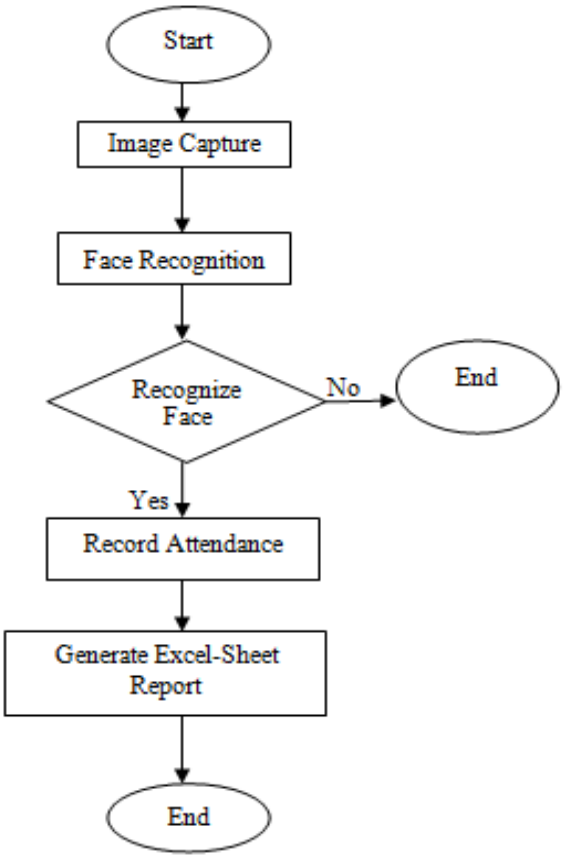

Figure 2: Basic Flow Chart

Step 1: **Face Detection:** Finding all of the faces is the first step in our project. Before we can try to distinguish the faces in a picture, we must first locate them. Face detection is an excellent camera feature because it selects the faces automatically to ensure that they are all in focus before the photo is taken.

Step 2: **Posing and Projecting Faces:** We must address the issue of faces facing different directions, causing the system to appear completely different. We've switched to a technique known as "Face Landmark Estimation" because it produces more forgiving results than others.

Step 3: **Face recognition:** It works by comparing unknown faces to all previously captured static photos. At this point, we only need to take a few measurements from each face. The following tasks are included in the training process:
1. Use data to load a known person's face image.
2. From the data, create a new image of the same person.
3. Replace the photo with one of a completely different person. After that, we consider a measurement-examining algorithm.

Step 4: **Deciphering the individual's name**: All that's left in the final stage is to find the person among our known people who have the most observations of our test image. Linear SVD classifiers are used for this. As a result, this classifier only takes milliseconds to run.

VII. RESULTS ANALYSIS AND DISCUSSIONS

Table 1: Simulations Parameters

Parameters	Value
Image Type	PNG, JPEG, TIFF
Metrics	MSE, SSIM

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Noise Type	Averaging, Gaussian, Median, Bilateral
Maximum No. of Iterations	20
Accuracy Percentage	78
Image Threshold	Colour Image, Greyscale
Image Module	ImgCodec Module
Cascade Detection	Detection of Eyes, Nose, Lips, Forehead
Simulation Environment	OpenCV, Python
Total No. of Images	10
Algorithm Used	KPCA & SVD
Simulation Time	1-3 Seconds
Interest Point	Detection and Matching
Edge Detection	Sobel, Laplacian, Canny
Feature Detection	Shift, ORB, HOG Method

First and foremost, we must enter the individual's data into the database. To do so, we'll need to give the photo a name. Now we need to take photos of the person using the webcam or any other cameras that are available, such as the laptop webcam we used. After that, the data is saved in a database. The camera starts recording and captures an image to get the results from the saved database.

Parameters Performance:

1. **Occlusions:** Occlusions are items that obstruct face recognition, such as a scarf, glasses, facial hair, or a cap. It's possibly the best test for face recognition software. The inability to perceive faces when they are obscured by obstacles is a well-known issue that faces recognition systems and even people face.

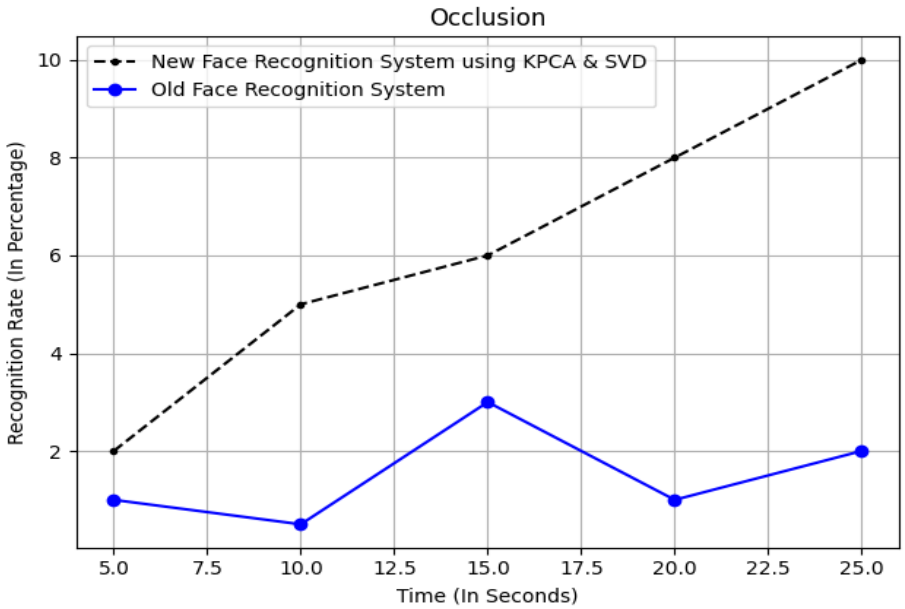

Figure 3: The graph shows the Time and Space Complexity of old and new face recognition system using KPCA and SVD.

The above figure shows the occlusion effect in an old face recognition system and a new face recognition system using KPCA and SVD. The percentage value may initially decrease, and then increase. It could be extremely useful in the old face recognition system. Also, because old algorithms require the entire face to be visible in front of the camera, the occlusion property is considered to be very poor in old algorithms.

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Table 2: The accuracy and division of images used in the project are depicted in the table below:

Image	Types of Division of Images	Occlusion Detection Percentage in Old Face Recognition System	Occlusion Detection Percentage in New Face Recognition System using KPCA and SVD
1	Sun Glasses	20%	80%
2	Scarf	25%	95%
3	Mask	35%	95%
4	Sun Glasses, Scarf	10%	96%
5	Sun Glasses, Scarf, Mask,	2%	87%

2. **Time and Space Complexity Performance Analyses:** It takes a long time to recognise a single face from its database folder, which contains many images of the same person in various poses; additionally, it does not always consider accurate results, which was a major flaw in the previous system. It takes a long time to recognise a single face from its database folder, which contains a large number of images of a single person in various poses; additionally, it does not always take into account the context of the image.

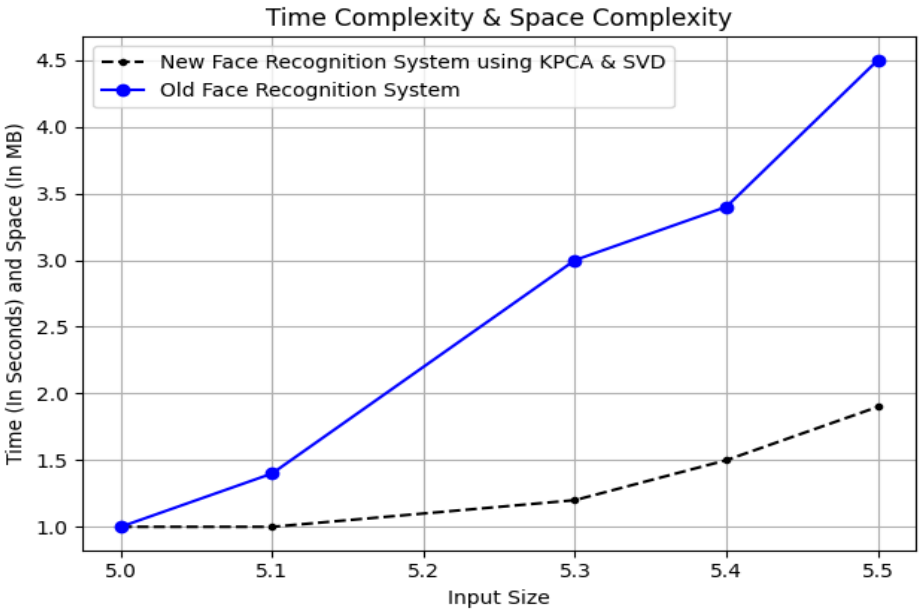

Figure 4: The graph shows the Time and Space Complexity of old and new face recognition system using KPCA and SVD.

Table 3: The table depicts the Worst Case, Average Case and Best Case Time and Space complexity of old Face Recognition System

Image	Worst Case	Average Case	Best Case
1	O(n^3)	O(n^2)	O(log)
2	O(n^3)	O(n^2)	O(log)
3	O(n^3)	O(n^2)	O(n^2)
4	O(n^3)	O(n^2)	O(n^2)
5	O(n^3)	O(n^2)	O(nlogn)

Table 4: The table depicts the Worst Case, Average Case and Best Case Time and Space complexity of New Face Recognition System using KPCA and SVD.

Image	Worst Case	Averaging Case	Best Case
1	O(n)	O(n)	O(1)
2	O(n)	O(n)	O(1)
3	O(log)	O(n)	O(1)
4	O(log)	O(n)	O(1)
5	O(n)	O(n)	O(1)

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The old face recognition system, as can be seen, has a time and space complexity of 0(n^3), which is considered the worst of the worst time and space complexity. Although one person needs 2-4 images of the same person to function properly, this does not always yield the desired results. Only one face photograph must be stored in the database folder for KPCA and SVD to function properly. It also yields better outcomes than expected. Because the image may contain noise, precise results are obtained.

3. **Aging Performance Analyses:** As picture-based client confirmation technology advances, face recognition technology is being used in a variety of applications. The scope of purpose is also broadening to accommodate new markets such as virtual information on the face and redesigned notices. Innovation has progressed to the point where it can now be used in sensitive areas like financial transactions and identification cards. Not only for security, but also for diversion. There are still issues, regardless of how far these innovations have progressed.

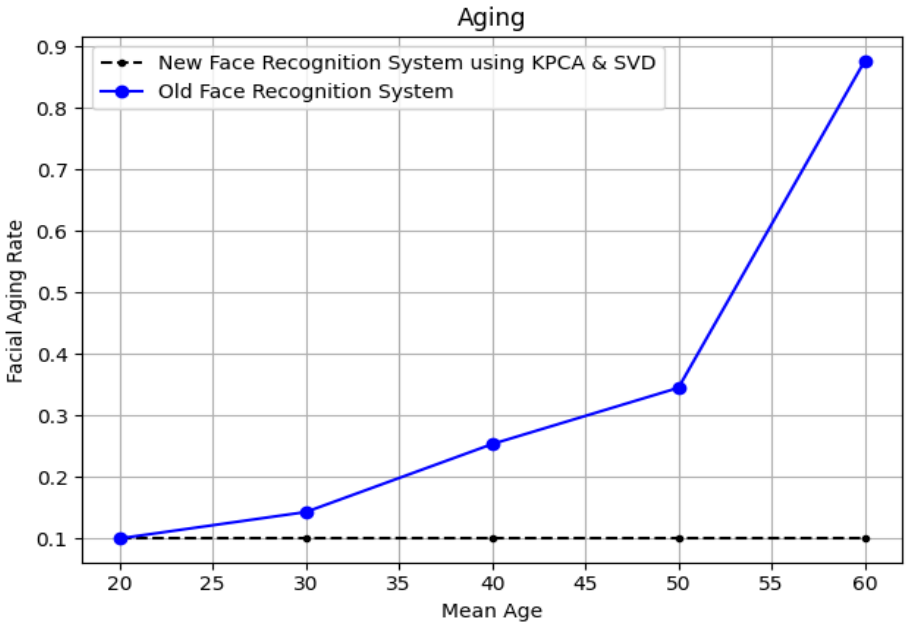

Figure 5: The graph shows the Aging effect of old and new face recognition system using KPCA and SVD

Table 5: The table displays the image's age limit and accuracy.

Image	Age Limit	Accuracy in Aging of Old Face Recognition System	Accuracy in Aging of New Face Recognition System using KPCA and SVD
1	1-18 Years	45%	95%
2	18-27 Years	42%	92%
3	27-45 Years	35%	93%
4	45-60 Years	17%	91%
5	60 and Older Years	6%	90%

4. **Face Expressions Performance Analyses:** The recognition of close-to-home looks is a focal point for successful relational correspondence. The purpose of this study is to see if changes in feeling acknowledgment capacity and emotional responses are associated with changes in mood (as measured by valence and excitement appraisals). Nonetheless, as people got older, there was a significant decline in acknowledgment precision for dread articulations.

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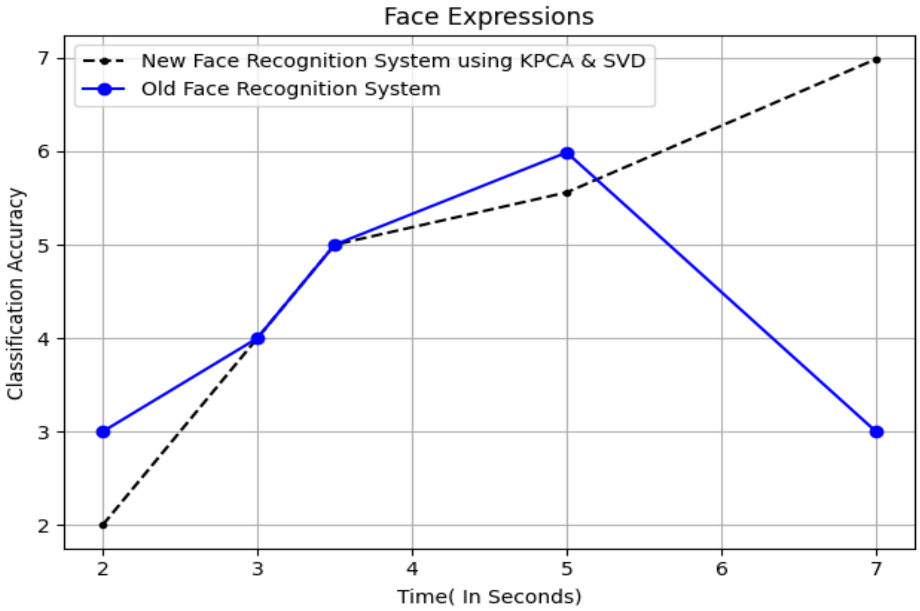

Figure 6: The graph shows the Face Expressions effect of old and new face recognition system using KPCA and SVD.

Face expressions will be depicted in the old system. If your facial expressions do not match those in the database folder, it is possible that it will fail to recognize you. It also depicts with time, as shown in the graph, where the accuracy peaks at 5 seconds and then gradually decreases.

Table 6: The table displays the image's accuracy in old and new face recognition

Image	Emotions	Accuracy of Old Face Recognition System	Accuracy of New Face Recognition System using PCA and SVD
1	Angry	55%	95%
2	Fear	32%	82%
3	Happiness	45%	85%
4	Sadness	17%	97%
5	Surprise	26%	86%

5. **Image Noise Performance Analyses:** Then, for execution, a near-concentrate between commotion expulsion separating for the full image and division-based strategy was established employing MSE and PSNR. The automated placement of fiduciary focuses is insufficient for excellent face recognition accuracy. To examine the overall look of the face without seeking to highlight specific emphasis, a complete method is applied. The disadvantage is that the accuracy acquired is only adequate for confirmation. Variations in the face caused by maturity, make-up, hairstyle, exhibitions, location, and lighting conditions will all have an effect on execution, even if twins cannot be separated.

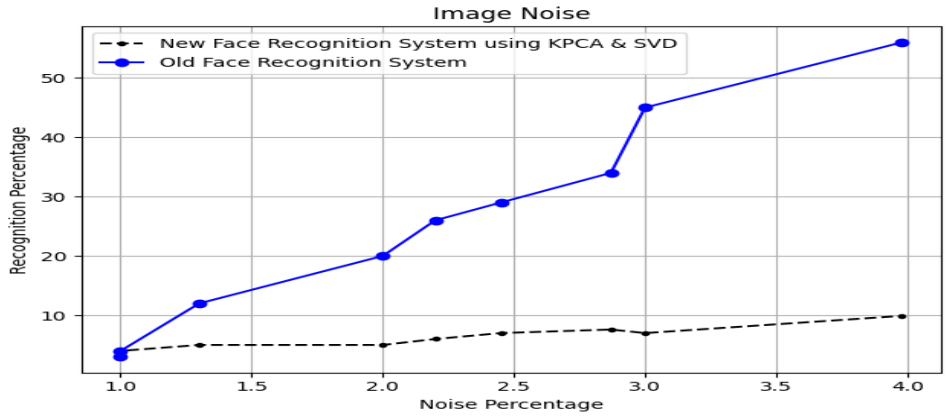

Figure 7: The graph shows the Image Noise of old and new face recognition system using KPCA and SVD

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The graph depicts the percentage of noise in both the old and new face recognition systems. As our images cannot be guaranteed to be noise-free, image noise can arise from a variety of sources. Gaussian, Bilateral, Median, and other noise reduction techniques can be used.

Table 7: The table displays the image's noise in old and new face recognition

Image	Noise Quality Descriptions	Noise Percentage in Old Face Recognition System	Noise Percentage in New Face Recognition System using KPCA and SVD
1	Gaussian Noise	55%	2%
2	Satisfactory	52%	5%
3	Un-Satisfactory	65%	6%
4	Salt Noise	67%	4%
5	Salt and Pepper Noise	56%	2%

The table shows that the noise in the previous system contained a high percentage of noise (more than 50%), indicating what types of noise it will not detect or clear on its own, and causing delays in the process

VIII. CONCLUSION AND FUTURE SCOPE

The objective is to automate and establish a system that can be used by corporations and educational organisations. One of the few biometric technologies that have gained a lot of attention is facial recognition. Face recognition technology is used in surveillance for a variety of purposes, including authentication, monitoring, access control, indexing, and maintenance. Even after a pandemic, attendance systems with facial recognition are essential modern utilities. These technologies assist you in tracking staff attendance while also saving money. This type of device also gives some amount of workplace security. The best current method for tracking staff hours is facial recognition technology. Precision is improved by using a hybrid model. The system does not require any specific software to be installed. The function as a whole is intended to raise student attention in class while also allowing the teacher to cover more content in each class hour by saving time. These are the new features introduced to the app to help and enhance online learning.

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