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Real Time Smart Surveillance SystemUsing Deep Learning

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Abstract : This paper proposes a real-time application for college students to identify and locate them within schools using CCTV cameras. The application uses four steps: recognizing each individual in the picture, calculating their face, coordinating their faces with a database of students' faces, and showing their face and staff data when a picture is captured. The application can be used by college directors and staff to identify students and distinguish them from outsiders. The combination of face recognition and deep learning can bring unused applications to the public security, using machine vision and video-based picture recovery technology to quickly locate lost students and identify outsiders.

IndexTerms **- Real Time,Automatic Detection,CCTV,Acadamics..**

I. INTRODUCTION What is Surveillance ?

Surveillance is the Monitoring of Behavior, many activates, or information for the purpose of information gathering, influencing, managing or directing.

What is Video Surveillance ?

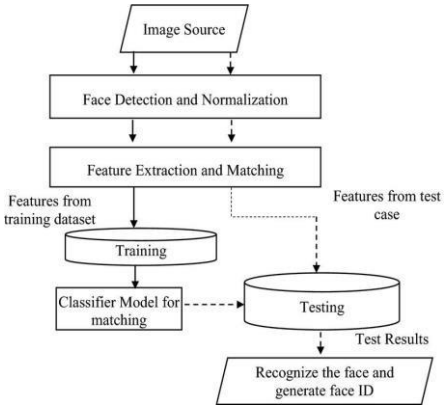
Video surveillance is the use of security cameras to monitor and record activity in a specific area or location for security, safety,or monitoring purposes.

Facial recognition technology is a complex and unique approach to identifying individuals based on their facial features. The process involves three major steps: curating a database of faces, detecting faces within the images, and training the face recognizer. The database is crucial for generalizing the algorithm across different facial characteristics, expressions, and environmental conditions. The recognition model then learns to extract discriminative features and patterns unique to each individual, often using advanced deep learning architectures.

The system is ready for deployment and evaluation, processing new facial images and attempting to match them against learned representations of known individuals. The system uses similarity metrics and decision-making mechanisms to identify and verify individuals based on the resemblance between their facial features and those stored in the database.

Facial recognition technology is interdisciplinary, drawing upon advancements in computer vision, machine learning, and pattern recognition. In educational settings, the algorithm can be extended with face recognition capabilities, learning to encode faces into a high-dimensional feature space. This allows the algorithm to identify students if a match is found. Additionally, the algorithm can be integrated with contextual information, such as student IDs or class schedules, to track attendance, participation, and engagement in various educational activities.

II. ARCHITECTURE DIAGRAM



2.1 System Architecture

III. LITERATURE SURVEY

Paper Name: Automation of surveillance systems using deep learning and facial recognition.
Author: Arpit Singh, Saumya Bhatt, Vishal Nayak & Manan Shah .
Description: This paper analyzes the precision of confront location and acknowledgment by analyzing OpenCV, Seetaface, and YouTu.Person re-identification is an vital procedure towards programmed look of a person's nearness in a reconnaissance video.This Program proposes a unused computer vision-based calculation from confront location innovation and confront acknowledgment technology.In the case where the counterbalanced point is somewhat bigger, the precision is steadily decreased as the point increments, and confront location cannot be performed indeed when a genuine counterbalanced happens.

Paper Name: Automation of surveillance systems using deep learning and facial recognition.
Author: Arpit Singh, Saumya Bhatt, Vishal Nayak & Manan Shah .
Description: The proposed real-time database coordinates framework is based on the VGGFace profound learning neural design. OpenCV's Haar Cascade Strategy was utilized to identify the facial locale from the input pictures, and the LBPH recognizer was prepared on the dataset created. Besides, live film was sent through the LBPH recognizer amid facial acknowledgment, which produced LBPs and histograms for each recognized face.The proposed approach appears the most elevated degree of acknowledgment precision by precisely recognizing each of the 26 people with a certainty level extending from 78.54 percent to 100 percent, a cruel normal of 96 percent on real-time inputs.it was found that when a modern confront was displayed to the recognizable proof show without being prepared, the acknowledgment model's certainty level dropped underneath 50–55 percent. As a result, at whatever point a confront was identified with a acknowledgment exactness of less than 55%, we labeled it as obscure acknowledgment.

Paper Name: Facial recognition technology in schools .
Author: Mark Andrejevic & Neil Selwyn.
Description: This system tend to work by computationally analyzing facial shapes and features in terms of the positioning and distancing between sets of geometric coordinates (for example, the centre of each pupil, the bridge of a nose, the ends of an eyebrow).This facial recognition application promise myriad benefits and conveniences including speedy and secure transactions, customized services, and enhanced public safety and security.are discernible through the face, and are open to manipulation.while facial recognition technology offers significant benefits in terms of efficiency, security, and personalization, it also poses risks

related to privacy invasion, identity fraud, and algorithmic bias. Addressing these concerns requires robust security measures, ethical guidelines, and ongoing research to mitigate vulnerabilities and ensure responsible deployment of the technology.

Paper Name: Face Recognition by Smart Sruveillance and Tracking System .

Author: Ghatge Surabhi, Gadekar Mayuri. Jagtap Prajakta. Dhanawade Sayali. Prof. Tawara Rutuja.
Description: In this project, real-time video streaming is processed, motion detection, and dual-axis pan-tilt servos track that person with a camera. In addition, such bizarre activity is recorded on video in sync from cloud storage, and mobile alerts are generated. When the Internet is not available, a website file is upgraded with an audio notification being sent to the security room

if an anonymous face is not present on the website.This project aims to replace expensive security systems using Raspberry pi 3B + as a laptop.This program can be used for home purposes as the door get lock. This wont be effective when used in public places.

Paper Name: Face Recognition System As A Survey.
Author: Yassin Kortli, Maher Jridi, Ayman Al Falou, Mohamed Atri.
Description: This procedure can be characterized by two noteworthy steps, key-point discovery and highlight extraction. The to begin with step centers on the execution of the locators of the key-point highlights of the confront picture. The moment step centers on the representation of the data carried with the key-point highlights of the confront picture. In spite of the fact that these procedures can fathom the lost parts and occlusions, scale invariant highlight change (Filter), double strong autonomous basic highlights (BRIEF), and speed-up strong highlights (SURF) strategies are broadly utilized to depict the include of the confront picture. its capacity to work with both recordings and pictures, to prepare in genuine time, to be strong in diverse lighting conditions, to be autonomous of the individual (in any case of hair, ethnicity, or sex), and to be able to work with faces fr om distinctive angles.The acknowledgment beneath the controlled situations has been immersed. By the by, in uncontrolled situations, the issue remains open owing to huge varieties in lighting conditions, facial expressions, age, energetic foundation, and so on.

IV. MOTIVATION OF PROJECT

Innovation has made it conceivable to screen all the cameras, indeed from a farther computer or portable. Other than, the CCTV security cameras offer the liven of seeing the live video on all the distinctive cameras in a single window, guaranteeing that all cameras record the output. Facial acknowledgment gives CCTV progressed security benefits and is one of the most modern observation arrangements. It is especially valuable for retailers, associations and all sorts of businesses as a security and security include as it will capture individuals of intrigued who may be approximately to commit a wrongdoing or are appearing suspicious conduct. You can too screen a person's section recurrence onto the premises, as well as screen their developments on the premises.

This sort of CCTV innovation can offer assistance to cut wrongdoing with its live facial acknowledgment technology. Facial acknowledgment will caution staff to an person who has entered the building. So, if there is a tireless troublemaker or criminal, staff are right away alarmed of their passage and nearness in arrange to expeditiously bargain with that person. As well as precisely identifying people, these sorts of cameras are moreover utilized to recognize vehicles. They advantage from night vision so will capture film and offer security 24/7 circular the clock.

Facial acknowledgment CCTV can be focused on and upgraded for greatest security. It is advantageous for the observation of confined zones, such as store rooms, ranges where there are tall esteem items and things and sauntering location to track somebody illustrating suspicious behaviour. Facial acknowledgment CCTV cameras are put and situated for the ideal reconnaissance precision, for occurrence at a fundamental section point. Staff and people can be included and sifted from CCTV.

V. OBJECTIVE OF THE PROJECT

Our Project provides a basic implementation of a face recognition system using OpenCV and MySQL for student identification. It detects faces in real-time using a webcam, performs recognition based on a pre-trained classifier, and displays the recognized faces along with associated student information. This system can be further improved by optimizing the face detection and recognition algorithms, handling database interactions more efficiently, and incorporating additional features such as multi-face recognition and tracking. Additionally, ensuring robustness to variations in lighting conditions and facial expressions is essential for real-world deployment.

VI. PROPOSED SYSTEM

Confront acknowledgment is a biometric innovation that includes distinguishing or confirming a person's character by analyzing and comparing designs from facial highlights. It has different applications extending from security frameworks to social media tagging.

Haar Cascades for Confront Detection:
Haar cascades are a machine learning-based approach utilized for question discovery in pictures. These cascades utilize Haar-like highlights, which are basic rectangular highlights utilized to recognize objects' characteristics. In the setting of confront discovery, Haar cascades are prepared to recognize designs related with human faces, such as the course of action of eyes, nose, and mouth. In our extend, the haarcascade_frontalface_default.xml record contains the prepared cascade for identifying frontal faces inside an picture. The CascadeClassifier lesson from OpenCV is utilized to stack this cascade and perform confront location in

real-time video streams.[SEP][SEP]face. If the confidence level of the prediction is above a certain threshold (77 in this case), the recognizer identifies the face with corresponding information. Otherwise, the face is labeled as "Unknown Face."

Real-time Video Processing:
The main loop captures frames from the webcam feed using the VideoCapture object. Each frame is processed for face detection and recognition using the recognize function. The annotated frames are displayed in a window titled "Welcome To Surveillance System" using cv2.imshow. The loop continues until the user presses the Enter key (cv2.waitKey(1)==13).

VII. ALGORITHM

Integration into a Surveillance System:
To implement a surveillance system for finding a student using Haar and LBP cascades, the following steps can be followed:

Step 1 : Data Collection
Gather a dataset of images containing students within the surveillance environment. These images should cover various poses, orientations, and lighting conditions to ensure robustness.

Step 2 : Preprocessing
Preprocess the images to enhance their quality and remove noise. This may involve techniques such as resizing, normalization, and grayscale conversion.

Step 3 : Training Haar Cascades
Train a Haar cascade classifier using a machine learning algorithm such as AdaBoost or SVM (Support Vector Machine). The classifier should be trained to recognize features specific to students, such as facial features or distinctive clothing patterns.

Step 4 : Training LBP Cascades
Similarly, train an LBP cascade classifier using a dataset of images. This classifier should focus on capturing the texture patterns associated with students' clothing or accessories.

Step 5: Cascade Integration: Integrate the trained Haar and LBP cascades into the surveillance system. This involves incorporating the classifiers into the image processing pipeline for real-time detection.

A. Haar Cascades:
Haar cascades are a machine learning-based approach used for object detection in images. They work by identifying specific features within an image, such as edges, corners, or textures, and using them to classify objects. In the context of surveillance systems, Haar cascades can be trained to recognize patterns associated with human faces or other body parts.

B. LBP Cascades:
Local Binary Patterns (LBP) are another popular technique for texture classification in images. LBP cascades operate by analyzing the local texture patterns of an image and classifying them based on predefined patterns. This method is robust to changes in illumination and is commonly used in tasks such as face recognition and pedestrian detection.

Step 6 : Detection and Tracking
Apply the cascades to the surveillance feed to detect and locate students within the environment. Use techniques such as bounding box detection and object tracking to monitor their movement.

Step 7 : Alerting and Response
Implement alert mechanisms to notify security personnel or relevant authorities in case of suspicious behavior or unauthorized access. This may involve triggering alarms, sending notifications, or activating surveillance cameras for closer monitoring.

Step 8 : Evaluation and Optimization
Continuously evaluate the performance of the surveillance system and fine-tune the cascade classifiers as needed. This includes adjusting parameters, retraining on new data, and addressing any false positives or false negatives encountered during operation

VIII. RESULTS

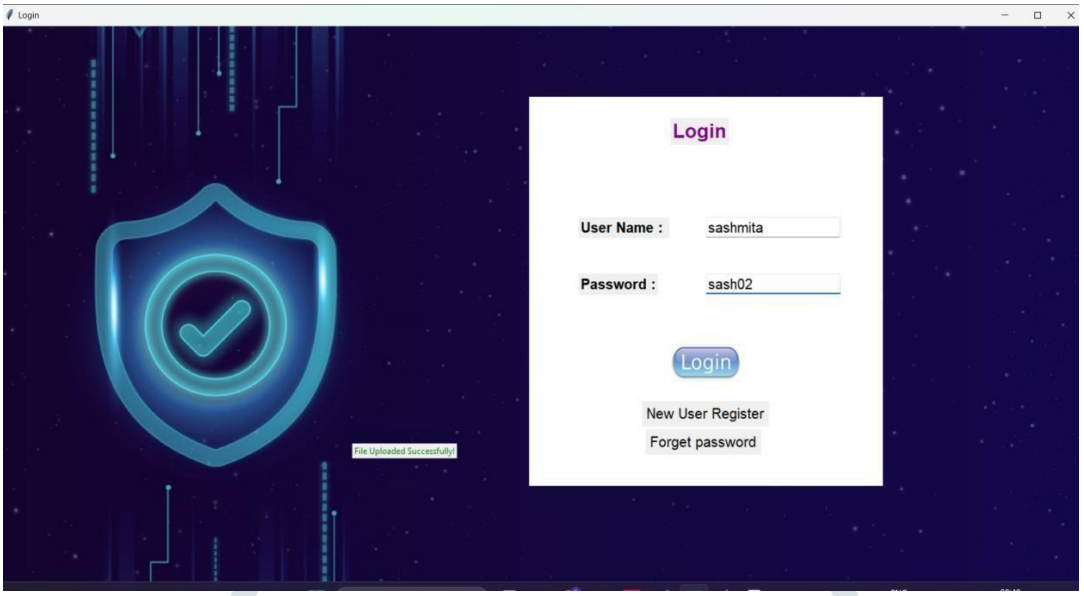


Figure No 8.1 : Login Page

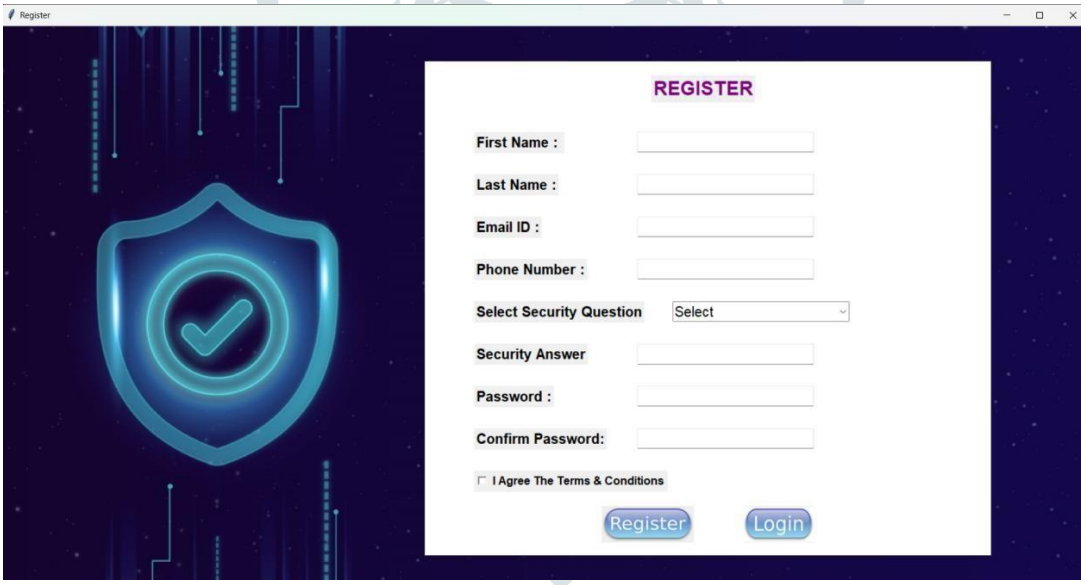


Figure No 8.2 : Registeration Page

Figure No 8.3 : Menu Page

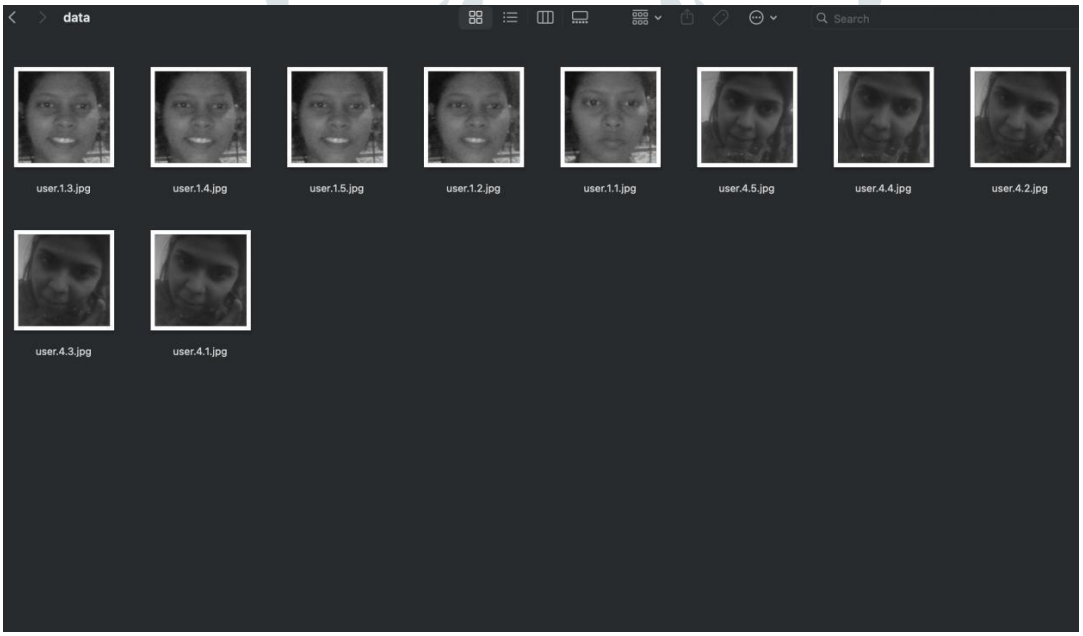


Figure No 8.4 : Trained Data

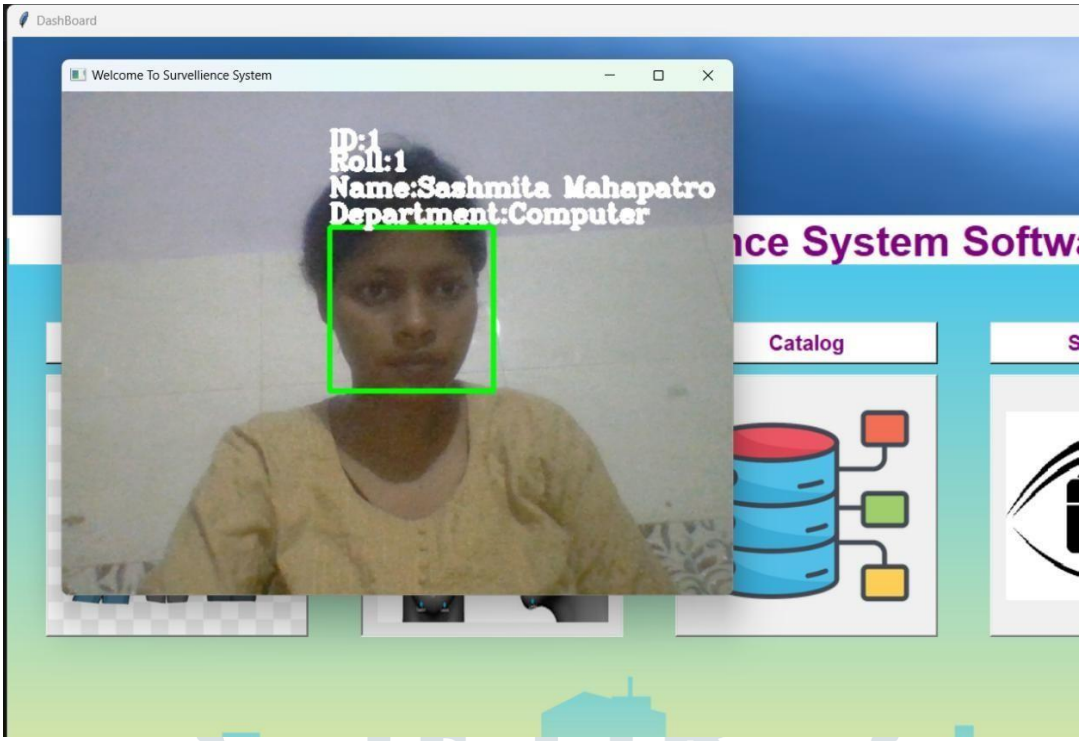


Figure No 8.5 : Face Identificatin

Query 1 | Query 2 | register | student

Limit rows | First row

dept	course	year	sem	student_id	name	division	roll	gender	dob	email
Computer	BE	2022-23	Semester-5	1	Sashmita Mahapatro	A	1	Female	Computer	sash@gmail.com
Mechanical	FE	2023-24	Semester-2	2	Sid	A	2	Male	11/01/2005	sid@gmail.com
(NULL)	*(NULL)*	*(NULL)*	*(NULL)*	*(NULL)*	*(NULL)*	*(NULL)*	*(NULL)*	*(NULL)*	*(NULL)*	*(NULL)*

Figure No 8.6 Database

IX. CONCLUSION

In conclusion, the confront location and acknowledgment calculation, fueled by computer vision strategies and profound learning models, offers a vigorous arrangement for finding and distinguishing understudies in instructive situations. Its capacity to precisely distinguish and recognize faces contributes to productive understudy following, checking, and personalized learning experiences.

We utilized Haar Cascades and LBP Acknowledgment for identifying faces. This procedure employments machine learning and is prepared on various pictures. It can at that point distinguish objects in other pictures. Moreover, we utilized Nearby Twofold Designs Histograms (LBPH) for recognizing faces. This calculation has a few focal points, counting proficient highlight choice and a locator that is invariant to scale and area. Instep of scaling the picture itself, we scale the highlights. The proposed framework for real-time computerized confront location and acknowledgment would be well-suited for applications in swarm reconnaissance.

X. ACKNOWLEDGMENT

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XI. REFERENCES

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