Advance Attendance system using face recognition system in python

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***Abstract*— In this digital era, face recognition system plays a vital role in almost every sector. Face recognition is one of the mostly used biometrics. It can used for security, authentication, identification, and has got many more advantages. Despite of having low accuracy when compared to iris recognition and fingerprint recognition, it is being widely used due to its contactless and non-invasive process. Furthermore, face recognition system can also be used for attendance marking in schools, colleges, offices, etc. This system aims to build a class attendance system which uses the concept of face recognition as existing manual attendance system is time consuming and cumbersome to maintain. And there may be chances of proxy attendance. Thus, the need for this system increases. In this method the camera is settled, and it will capture the image, the faces are recognized after that recognized along with the data base and eternfally the attendance is marked. This system is dependent on face detection and recognition concept, that detects the employees or student using webcam when they arrive in the office or classroom and marks the attendance by recognizing**

Keywords—component, formatting, style, styling, insert (*key words****)***

I. LITERATURE REVIEW / RELATED RESEARCH OUTCOMES:

In [1] 2017 Samuel John presented a Face Recognition Attendance System with GSM Notification. This system uses theViolaJones algorithm. This algorithm used for detect faces. Also, Fisher faces algorithm was used to create patterns of the faces which were caught. That created templates stored in the database. This system used library which is OpenCV and used Software Development Kit (SDK) to create the graphical user interface. In[2] other paper, Jenif D Souza introduces a Automated Attendance Marking and Management System by Facial Recognition. This system marked students attendance automatically by the camera which captures the photo of studentin the class. This system uses the algorithm called Histogram. Histogram algorithm used for face identification purpose. In this algorithm, The face image is converted to matrix form. Histogram are used for recognize of the exact faces. This system overcome the problem of time consuming. In[3] 2019 Nandhini R. introduced Attendance System based on face recognition. This system captures the video of the students, convert it into frames and store it in the database. Also, Convolution Neural Network (CNN) algorithm is used to detect faces. This System helps in improving the accuracyand speed.

In[4] 2016, E Vardharajan, R Dharani, S Jeevitha,S Hemalata introduced Automatic Attendance Management System Using Face Recognition. In this system the use Eigen Faces, Eigen Weight method for face detection this system the camera detention the image and then system crop the faces ofstudent and tie the faces with student database.

Authors in [5] researches to get best facial recognition algorithm (Eigenface and Fisherface) provided by the Open CV 2.4.8 by comparing the Receiver Operating Characteristics (ROC) curve and then implemented it in the attendance system. Based on the experiments carried out in this paper, the ROC curve proved that, Eigenface achieves better result than Fisherface. System implemented using Eigenface algorithm achieved an accuracy rate of 70% to 90%. In [6], authors proposed a method for student attendance system in classroom using face recognition technique by combining Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT). These algorithms were used to extract the features of student's face followed by applying Radial Basis Function (RBF) for classifying the facial objects. This system achieved an accuracy rate of 82%. attendance management process and reducing errors. However, the implementation of face recognition-based attendance systems in educational institutions and workplaces requires careful consideration of technical feasibility, accuracy, and user acceptance.

The lack of research on the feasibility and accuracy of face recognition-based attendance systems in different contexts, such as different lighting conditions, poses, and occlusions, is a major research gap. Moreover, the user acceptance and ethical implications of using biometric technology also need to be investigated. Therefore, the research problem is to evaluate the feasibility, accuracy, and user acceptance of face recognition-based attendance systems, identify the factors that affect their performance and adoption, and

address the ethical and legal implications of using such technology in educational institutions and workplaces. Ultimately, the goal is to provide recommendations for improving the efficiency, accuracy, and user acceptance of attendance management systems while ensuring ethical and legal compliance.

II. RESEARCH PROBLEM:

The research problem for face detection attendance system arises from the limitations of traditional attendance management systems, which are time-consuming, prone to errors, and require manual input. These limitations often result in inaccurate attendance records, which can affect payroll processing, student performance evaluation, and other critical functions. Biometric technology, such as face recognition, has emerged as a promising solution to address these issues by automating the attendance management process and reducing errors. However, the implementation of face recognition-based attendance systems in educational institutions and workplaces requires careful consideration of technical feasibility, accuracy, and user acceptance.

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III. RESEARCH METHODOLOGY:

This Proposed system improve the attendance management system using of our unique characteristics of their face. For the purpose of confirmation and documentation face acknowledgment technique is used. The algorithm which uses for biometric facial recognition follow different steps of image processing. Capture- The first step of this system is to gather physical or communication tests in predefined situations and through the state period of that time. Extraction- In this step, all data will be extracted from the samples created to make template using facial recognition. Comparison- After finishing the extraction step collected data is compared with existing that templates. Matching-In this last stage of face recognition, the face features of a gathered samples are matching with the one from a facial database or not. It will take just a second. In this system we can use Haar Cascade method. A Haar Cascade is used in image recognition and image processing that us specially designed for pixel data.

IV. TOOLS / TECHNIQUES TO BE USED FOR DATA ANALYSIS:

- OpenCV: OpenCV is an open-source computer vision library that can be used for face detection and recognition. It has built-in algorithms for face detection and recognition and can be used with Python, C++, and Java.
- Microsoft Excel: Microsoft Excel is a widely used tool for data analysis. It has built-in features for descriptive statistics, regression analysis, and data visualization.
- Pickle: It is a commonly used Python library for serializing and deserializing Python objects. It allows you to save Python objects, such as trained models, to disk and load them back into memory later.When it comes to face detection systems, Pickle can be used to save and load trained face detection models.
- KNN: KNN is primarily a classification algorithm, it can be used for face detection by treating it as a binary classification problem (i.e., determining whether a given image contains a face or not).It is a simple and intuitive algorithm that doesn't require explicit training in the traditional sense. It relies on comparing new instances with labeled instances in the training set.
- win32com.client: This module is used for interacting with the Windows COM (Component Object Model) interface. More specifically, it is used to utilize the Microsoft Speech API (SAPI) for text-to-speech functionality. Here's a breakdown of the role performed by the win32com.client module and its associated Dispatch class.

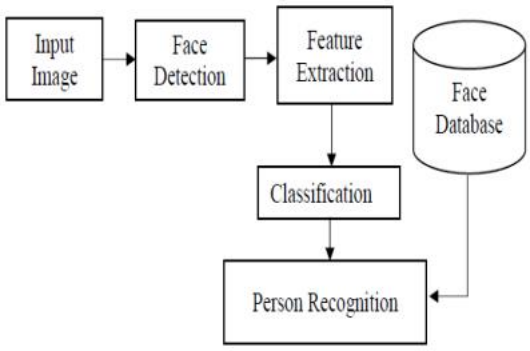


Fig 1. Block Diagram

V. SOFTWARE DESCRIPTION

1. **OpenCV** Open CV (Open Source Computer Vision Library) is a open source computer vision

software library for the purpose of machine learning. Open CV was developed to serve the purpose of computer vision applications and to stimulate the usage of machine perception in the commercially viable products. Open CV is a BSD-licensed product which is easy for the utilization and modification of the code. The library contains more than 2500 advanced algorithms including an extensive set of both typical and state-of-the-art computer vision and machine learning algorithms. These algorithms can be employed for the detection and recognition of faces, identification of objects, extraction of 3 D models of objects, production of 3 D point clouds from stereo cameras, stitching images together for production of a high resolution image of an entire scene, finding similar images from an image database, removing red eyes from images taken using flash, following eye movements, recognition of scenery and establishing markers to overlay it with intensified reality etc. It includes C++, Python, Java and MATLAB interfaces and supports Windows, Linux, Android and Mac OS. Open CV mainly involves real-time vision applications taking advantage of MMX and SSE instructions when available. A full-featured CUDA and Open CL interfaces are being progressively developed. There are over 500 algorithms and about 10 times functions that form or back those algorithms

2. **Pandas** Pandas is an open source Python package that caters diverse tools for data analysis. The package contains various data structures that can be used for many diverse data manipulation tasks. It also includes a range of methods that can be invoked for data analysis, which becomes feasible when working on data science and machine learning problems in Python.

3. **Idle** IDLE is Python's Integrated Development and Learning Environment. IDLE is completely coded in Python, using the tkinter GUI toolkit. It works mostly uniformly on Windows, Unix and macOS. It has a Python shell window (interactive interpreter) with colorizing of error messages, code input and code output. There is a multi-window text editor with multiple undo, Python colorizing, smart indent, call tips, auto completion, and other features. Searching within any window, replacing within editor windows and searching through multiple files is possible. It also has configuration, browsers and other dialogs as well.

4. **Microsoft Excel** Microsoft Excel is a spreadsheet program incorporated in Microsoft Office suite of applications. Spreadsheets prompt tables of values arranged in rows and columns that can be mathematically manipulated using both basic and complex arithmetic functions and operations. Apart from its standard spreadsheet features, Excel also extends programming support via Microsoft's Visual Basic for Applications (VBA), the capacity to access data from external sources via Microsoft's Dynamic Data Exchange (DDE) and extensive graphing and charting abilities. Excel being electronic spreadsheet program can be used to store, organize and manipulate the data. Electronic spreadsheet programs were formerly based on paper spreadsheets used for accounting purpose. The basic layout of computerized spreadsheets is more or less same as the paper ones. Related data can be stored in tables - which are a group of small rectangular boxes or cells that are standardized into rows and columns

VI. FLOW CHART

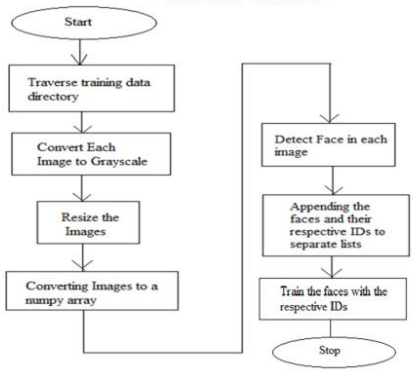


Fig 2. Flow-chart of the methodology used for Training Process

DATABASE CREATION: The first step in the Attendance System is the creation of a database of faces that will be used. Different individuals are considered and a camera is used for the detection of faces and the recording of the frontal face. The number of frame to be taken for consideration can be modified for accuracy levels. These images are then stored in the database along with the Registration ID.

TRAINING OF FACES: The images are saved in gray scale after being recorded by a camera. The LBPH recognizer is employed to coach these faces because the coaching sets the resolution and therefore the recognized face resolutions are completely variant. A part of the image is taken as the centre and the neighbours are thresholded against it. If the intensity of the centre part is greater or equal than it neighbour then it is denoted as 1 and 0 if not. This will result in binary patterns generally known as LBP codes.

FACE DETECTION: The data of the trained faces is stored in .py format. The faces are detected using the Haar cascade frontal face module.

FACE RECOGNITION: The data of the trained faces are stored and the detected faces are compared to the IDs of the students and recognized. The recording of faces is done in real time to guarantee the accuracy of the system. This system is precisely dependant on the camera's condition.

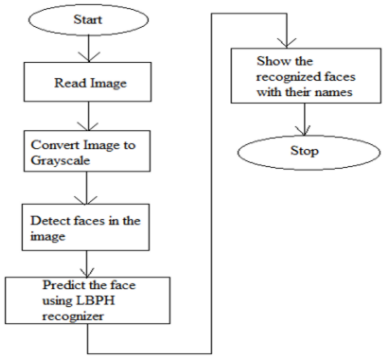


Fig 3. Flow-chart of the methodology used for Face Detection and Recognition

VII RESULT ANALYSIS

The interface for the Smart Attendance System has been created. Using the interface the images of the individual students is being recorded and stored in the training dataset. Simultaneously their information is stored in the database i.e. excel sheet. Finally the images of the students is being tracked and recognized.

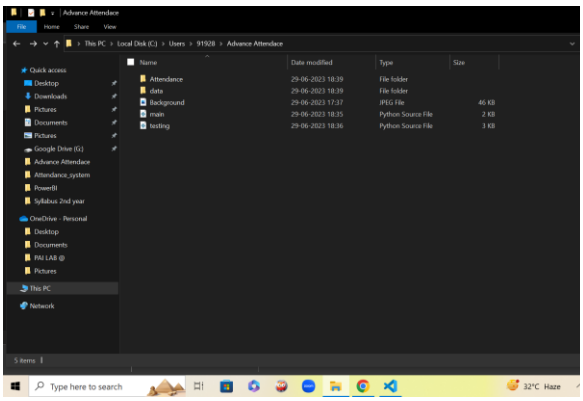
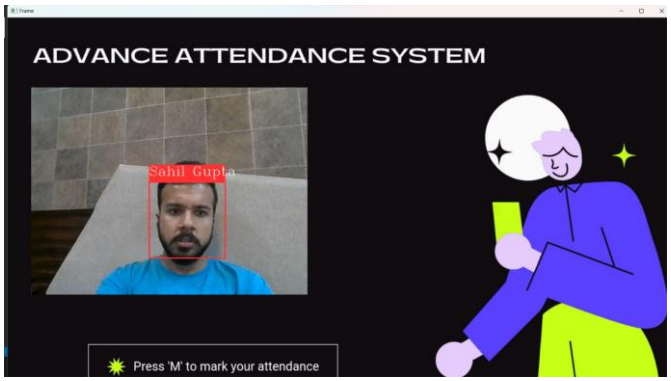


Fig 4.The different folders have been created.



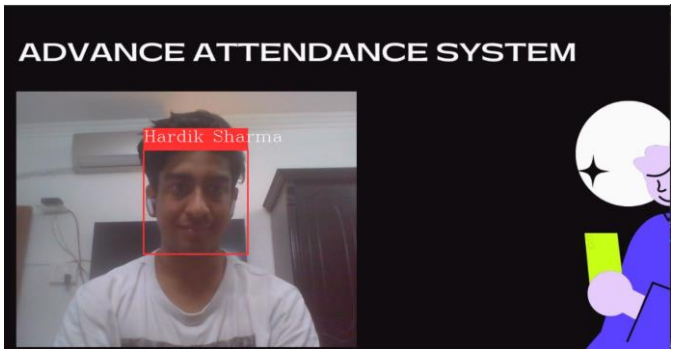


Fig 5.Testing and Processing of the Face image for Recognition

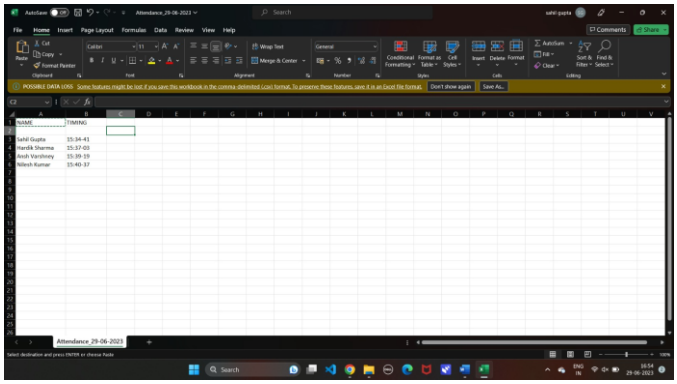


Fig 6. The following Csv File is Created with the Attendance

IX. FUTURE SCOPE

The prospects of advanced attendance systems are promising, driven by ongoing technological advancements across industries. There are several potential avenues for development. Firstly, integrating more sophisticated biometric technologies like facial recognition, iris scanning, and fingerprint recognition can enhance accuracy and eliminate the need for physical identification cards. Secondly, leveraging artificial intelligence and machine learning algorithms can make attendance systems more intelligent, enabling them to analyze patterns, predict future attendance,

detect anomalies, and generate insightful reports. Real-time monitoring capabilities would provide supervisors with up-to-date attendance data for better decision-making. Integration with mobile and wearable devices would offer convenient attendance marking options, while IoT integration would enable connectivity with other organizational systems. Advanced analytics and insights derived from attendance data would aid in identifying trends and making data-driven decisions. Automation and customization features, along with a strong focus on privacy and security, are also key considerations., the future of advanced attendance systems will likely witness continued innovation and adoption, shaping various industries.

X. CONCLUSION

In conclusion, face recognition using OpenCV has made significant progress in recent years, thanks to advances in deep learning and other techniques. The methodology and technology of face recognition using OpenCV involve several steps, including face detection, feature extraction, and face matching, as well as various tools and techniques such as OpenCV libraries, the Haar Cascade classifier and k-NN algorithm, The results of various studies have demonstrated the effectiveness of these algorithms and techniques in achieving high accuracy and performance in face recognition.

XI ONLINE RESOURCES:

- Kennedy Ok okpujie,Etinosa Noma Osaghae,Samuel John, Kalu-Anyah Grace, Imhade Okokpujie "A face Recognition Attendance system with GSM Notification" in IEEE NIGERICON 2017. https://ieeexplore.ieee.org/document/8281895
- Jenif D Souza, Jothi S, Chandrasekar A, "Automated Attendance Marking and Management System by Facial recognition using Histogram" in 2019, https://ieeexplore.ieee.org/document/8728399
- Nandhini R, Duraimurugan N, S.P Chollalingam " Face Recognition Attendance System" in IJEAT 2019, https://www.ijeat.org/wpcontent/uploads/papers/v8i3S/C
- E Varadharajan , R Dharani , S.Jeevitha, B Kavinmathi, S. Hemalatha " Automatic Attendance Management system using face detection" at ICGET 2016. 2020 Department of Information Technology, https://ieeexplore.ieee.org/abstract/document/7916753
- Shreyak Sawhney, Karan Kacker ,Samayak Jain, Shailendra Narayan, Rakesh Garg "Real Time Smart Attendance system using face recognition techniques "in international conference on cloud computing data science and engineering 2019.
- https://ieeexplore.ieee.org/abstract/document/8776934
- Poornima S,Sripriya N, Vijayalakshmi B, Vishnupriya P " Attendance monitoring system using facial recognition with audio output gender classification in ICCCSP 2017.
- https://ieeexplore.ieee.org/document/7944103
- Kritika Shrivastava, Shweta Manda,P.S Chavan, "Conceptual model for proficient automated attendance system based on face recognition and gender classification using Haar-cascade" in IJEAT https://www.ripublication.com/ijaer18/ijaerv13n10_111.pdf
- https://towardsdatascience.com/face-recognition-how-lbph-works90ec258c3d6b
- https://www.pyimagesearch.com/2018/09/24/opencv-facerecognition/
- http://nxglabs.in/cloud/impact-biometric-attendance-systemeducational-institutes.html
- http://www.ijsrp.org/research-paper-0218/ijsrp-p7433.pdf