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Face Recognition Using Deep Learning Method for Active Face Shape Model in Academic Action

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ABSTRACT

An essential administrative task in educational institutions, attendance management has a direct impact on student performance monitoring and academic evaluation. Conventional manual attendance procedures are laborious, prone to human mistake, and susceptible to proxy attendance. This project offers a Web-Based Automated Attendance Management System with Facial Recognition combined with a distributed microservices architecture to get around these restrictions. The suggested method automates the process of marking attendance by using computer vision techniques for face identification and recognition. Haar Cascade classifiers are used for facial detection, while the OpenCV library's Local Binary Patterns Histogram technique is used for recognition. Biometric is a pattern recognition system which is used for automatic recognition of persons based on characteristics and features of an individual. Face recognition with high recognition rate is still a challenging task and usually accomplished in three phases consisting of face detection, feature extraction, and expression classification. Precise and strong location of trait point is a complicated and difficult issue in face recognition. Cootes proposed a Multi Resolution Active Shape Models (ASM) algorithm, which could extract specified shape accurately and efficiently. Furthermore, as the improvement of ASM, Active Appearance Models algorithm (AAM) is proposed to extracts both shape and texture of specified object simultaneously. In this paper we give more details about the two algorithms and give the results of experiments, testing their performance on one dataset of faces. We found that the ASM is faster and gains more accurate trait point location than the AAM, but the AAM gains a better match to the texture.

Keywords: Face Recognition, Active Face Shape Model (AFSM), Active Appearance Model (AAM).

I. INTRODUCTION

With the rapid evolution of information technology, pattern recognition, artificial intelligence and other new technologies, face recognition has a lot of potential computer applications such as social media and multimedia communication, human-computer interaction, human detection, security and access control, which has become one of the important topics of research in recent years. Face recognition mainly includes face detection, feature extraction, texture variance, and classification. Attendance monitoring is an essential administrative activity in educational institutions. Traditionally, attendance has been recorded manually by instructors during classroom sessions. Although simple in implementation, the manual method is time-consuming, prone to human error, and vulnerable to proxy attendance. With the advancement of computer vision, machine learning, and web technologies, automated attendance systems have emerged as a practical and scalable solution to address these

limitations. Manual attendance systems involve recording student presence using paper registers or spreadsheets. Instructors call out names or circulate attendance sheets for signature. Although simple to implement, this method consumes valuable classroom time and is highly prone to human error. It also allows impersonation or proxy attendance, which affects the integrity of academic records. From a data management perspective, manual systems lack centralized storage and require additional effort for report generation and long-term record maintenance. These limitations motivated the development of automated attendance systems.

Radio Frequency Identification (RFID) systems were introduced to automate attendance recording. In this approach, students carry RFID cards, and attendance is marked when the card is scanned through a reader. While RFID reduces manual effort, it introduces dependency on physical hardware and cards. One major drawback of RFID-based systems is card sharing, which enables proxy attendance. Additionally, hardware installation and maintenance increase institutional costs. The system also requires students to physically interact with the reader, which may cause delays during large classroom sessions.

Fingerprint recognition systems use biometric scanners to identify students based on unique fingerprint patterns. These systems offer higher accuracy compared to RFID and reduce impersonation risks. However, they require specialized hardware devices and regular maintenance. Fingerprint systems also involve physical contact with scanning devices, which raises hygiene concerns. In large classrooms, sequential scanning may result in time delays. Furthermore, integration with web-based reporting systems may require additional infrastructure.

II. RELATED WORK

Attendance management has evolved significantly over the past decades with the advancement of information technology and biometric systems. Traditional manual attendance methods were gradually replaced by automated systems that aimed to improve accuracy, reduce administrative workload, and prevent fraudulent practices such as proxy attendance. Researchers and developers have explored multiple approaches including RFID-based systems, fingerprint recognition, iris scanning, and facial recognition techniques. Among various biometric technologies, facial recognition has gained substantial attention due to its contactless nature and ease of integration with existing camera infrastructure. This chapter reviews existing attendance management methods and highlights the technological advancements that led to the development of the proposed web-based face recognition system.

[1] In this work, we present a novel approach to face recognition which considers both shape and texture information to represent face i\mages. The face area is first divided into small regions from which Local Binary Pattern (LBP) histograms are extracted and concatenated into a single, spatially enhanced feature histogram efficiently representing the face image. The recognition is performed using a nearest neighbour classifier in the computed feature space with Chi square as a dissimilarity measure. Extensive experiments clearly show the superiority of the proposed scheme over all considered methods (PCA, Bayesian Intra/extrapersonal Classifier and Elastic Bunch Graph Matching) on FERET tests which include testing the robustness of the method against different facial expressions, lighting and aging of the subjects.

Face detection is an essential part of many applications, such as security systems, social networking platforms, and human-computer interaction. In order to detect human faces, this work investigates the application of the Viola-Jones algorithm in a graphical user interface (GUI) system created with Matlab. The Viola-Jones algorithm is a cutting-edge real-time face detection technique that uses AdaBoost learning to choose the most important features [13], Haar-like features, and an integral picture for quick feature

computation. Fifteen randomly chosen photos from the internet with both single and numerous faces were used to test the system. The algorithm's efficacy in face detection is demonstrated by the results, which show an average accuracy of 89.86%. Nevertheless, other restrictions were noted, such as blocked faces, non-frontal facial angles, and subpar identification in dimly lit environments. These difficulties draw attention to how outside variables affect detection accuracy and point to possible areas for improvement, such using sophisticated preprocessing techniques or combining the algorithm with cutting-edge machine learning approaches. This study highlights the need for more research to increase the Viola-Jones algorithm's robustness in a variety of complicated circumstances while reaffirming its applicability.

Emerging technologies have made tremendous changes in people's daily lives, and they have profoundly influenced their economic and consumption activities. Recently, the COVID-19 pandemic has also drastically increased individuals' usage of contactless payment technologies, such as mobile and facial recognition payments, which has accelerated the transformation of digital transaction services in China. In this study, the findings show that perceived usefulness, perceived ease of use, and service security can affect the perceived value and user satisfaction of using contactless payment. Moreover, a higher perceived value and satisfaction level may encourage more post-adoption behaviors, such as continuous and habitual usage of contactless payment methods or encouraging others to use contactless payment methods via word-of-mouth; however, perceived value did not have a direct effect on continuous usage. In addition, there are certain differences in user behavior depending on whether facial recognition payment or mobile QR-code payment is used. For QR-code payment users, overall, their satisfaction and post-adoption behaviors are more strongly bonded with each other compared with the behaviors of facial recognition payment users. This study has generated more information and insight into the transformation of digital payment and can help managers align their strategies more efficiently in the post-pandemic era [7].

III. RESEARCH METHODOLOGY

3.1 SCOPE OF THE PROJECT

The scope of the proposed system includes the development of a web-based attendance management platform for educational institutions. The system supports student registration through webcam-based image capture, model training for facial recognition, real-time attendance marking, subject-wise attendance tracking, and automated report generation.

The system provides role-based access control, where administrators can manage instructors and oversee system operations, while instructors can conduct attendance sessions for assigned subjects. Attendance records are stored in a structured PostgreSQL database and can be retrieved, filtered, and exported as needed.

The biometric recognition process is implemented using Haar Cascade classifiers for face detection and the LBPH algorithm for face recognition. The system is optimized for real-time performance without requiring specialized GPU hardware, making it suitable for deployment in standard institutional computing environments.

The project focuses on classroom-level attendance automation and does not extend to surveillance or large-scale public monitoring applications. However, the architecture is designed in a way that future enhancements such as deep learning-based recognition models or cloud deployment can be incorporated. Face recognition technology emerged as a more natural and non-intrusive biometric solution. It uses computer vision algorithms to detect and identify individuals based on facial features. Early face recognition systems were implemented using classical algorithms such as Eigenfaces, Fisherfaces, and Local Binary Patterns Histogram (LBPH). The development of libraries such

as OpenCV significantly accelerated research in face recognition by providing pre-built modules for face detection and recognition. Haar Cascade classifiers were commonly used for detecting faces in images, while LBPH was widely adopted for recognition due to its computational efficiency. Although early implementations were primarily standalone desktop applications using local storage, they demonstrated the feasibility of real-time automated attendance systems without requiring additional biometric hardware.

With the growth of cloud computing and web technologies, attendance systems evolved from standalone applications to web-based platforms. Modern systems integrate frontend interfaces, backend APIs, and centralized databases to enable remote access and scalable data management.

Frameworks such as FastAPI and Express.js facilitate the development of RESTful APIs, enabling structured communication between frontend and backend services. Cloud database platforms such as Supabase provide scalable PostgreSQL storage with authentication and real-time capabilities. These advancements allow attendance systems to support role-based access control, centralized monitoring, and secure data storage, overcoming many limitations of earlier standalone implementations.

In educational institutions, attendance records play a significant role in academic evaluation, eligibility verification, and performance tracking. Manual attendance systems require instructors to call out names or circulate attendance sheets, which consumes valuable instructional time. Furthermore, students may engage in proxy attendance practices, thereby compromising the integrity of attendance records.

Although biometric systems such as fingerprint scanners and RFID cards have been introduced to automate attendance, these systems often require additional hardware infrastructure and are susceptible to misuse, such as card sharing. Facial recognition offers a contactless, non-intrusive, and natural method of biometric authentication. Since facial characteristics are unique to individuals, the probability of duplication or impersonation is significantly reduced.

The motivation behind developing this upgraded system stems from the need to build a scalable, secure, and web-accessible attendance management platform that integrates artificial intelligence with modern web architecture. By combining facial recognition with a microservices-based backend and cloud database integration, the system not only automates attendance marking but also ensures centralized data management, role-based access control, and real-time monitoring.

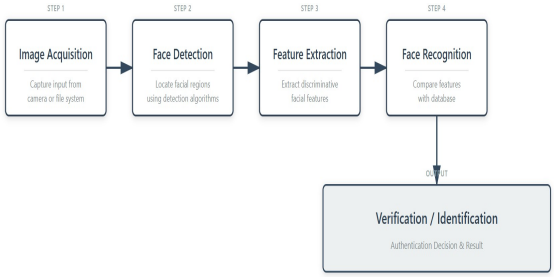

Figure 3.1: Work Motivation Model

Fundamental concepts

The proposed system is a Web-Based Automated Attendance Management System using Face Recognition and Microservices Architecture. The system leverages facial biometric identification to automate the attendance marking process. It integrates real-time face detection and recognition with a distributed web-based infrastructure consisting of a modern frontend interface, a gateway API layer, a core backend service, and a cloud-hosted database.

Unlike earlier standalone desktop-based implementations, the modified system adopts a full-stack architecture where each layer performs a dedicated role. The frontend, developed using modern web technologies, provides a responsive user interface for administrators and instructors. The gateway API handles request routing and communication management. The backend service performs business logic processing, database operations, and biometric computation. The face recognition engine, powered by OpenCV and the

Local Binary Patterns Histogram (LBPH) algorithm, performs real-time identity verification. Persistent data storage is managed through a PostgreSQL database hosted on Supabase, ensuring reliability and scalability. This integrated approach ensures automation, accuracy, transparency, and efficiency in attendance management. To summarize our contribution, we find that a lot of Face recognition algorithms have been proposed. So far, all these algorithms are based on ASM or AAM separately or in cascade [5] [6].However, Previous research has examined the effects of ASM or AAM on recognize the accurate location of the facial feature points from a face image. In contrast, there is a few researches compares the accuracy and efficiency of two algorithms in facial feature detection. In this research we give more details about the two algorithms and give the results of experiments, testing their performance on one dataset of faces. We measure their accuracy by locating landmark points, and their efficiency.

Techniques

We have used deep learning techniques to develop this system, histogram of oriented gradient method is used to detect faces in images and deep learning method is used to compute and compare feature facial of students to recognize them. Our system is capable to identify multiplefaces in real time.

Techniques for Detecting Face

LBPH algorithm, in this algorithm once the detection of faces is done, the faces are cropped from the image. This system compares the image of the test and the training image and determine who is present and who is not present. The attendance data is stored in an Excelsheet that is automatically updated in the system.

Proposed Algorithms

3.2 PROPOSED ACTIVE FACE SHAPE MODEL (AFSM)

The shape of an object is represented through landmarks which are one chain of consecutive traits points, each of which is important, point existent in most of the images being considered, for example, the location of the right eye. Enough number of trait points should be provided to cover the comprehensive shape and details. In the proposed model, a total of 68 trait points are defined to explain the shape of a human face, covering the areas of the eyebrows, cheeks, eyes, mouth, and nose. A group of landmarks forms a shape. Meanwhile, the shapes are represented as vectors: all the x- coordinates pursued by the y-coordinates of the points in the form. Align one shape to other with a correspondence transform (allowing rotation, scaling, rotation, and translation) that reduce the Euclidean distance average between shape points. The mean shape is declared the middle of the stratified training shapes [8]. The ASM beginning the search for facial landmarks from the mean shape aligned to the place and size of the face specified by a global face detector. It then reiterates the following two steps until convergence: (i) propose a temporary shape by determining the positions of shape points through template appropriating from the image texture concerning each point. (ii) Confirms the temporary shape to a universal shape model. The special template suitability is uncertain and the form model gathers the outcomes of the weakened form matches to form a powerful classifier. The complete search is reiterated at each level in an image pyramid, from poor to fine resolution.

Local Binary Patterns Histogram

Local Binary Patterns Histogram algorithm (LBPH) is for face recognition. It is based on local binary operator, and it is one of the best performing textures descriptor. The need for facial recognition systems increasing day by day as per today's busy schedule. They are being used in entrance control, surveillance systems, smartphone unlocking etc. In this article, we will use LBPH to extract features from an input test image and match them with the faces in system's database. Local Binary Patterns Histogram algorithm was proposed in 2006. It is based on local binary operator.

The steps involve
The main objective of this are:

- creating datasets
- face acquisition
- feature extraction
- classification

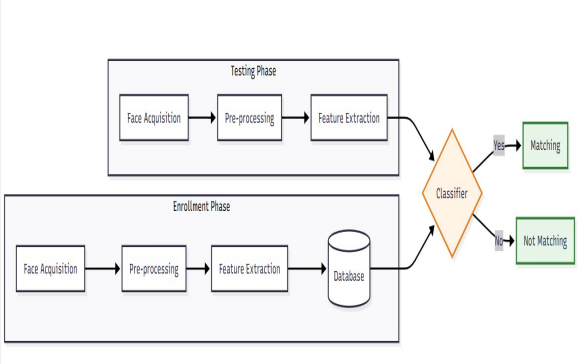

Figure 3.2 : Steps involved in LBPH

We proposed the new methodologies for an automated attendance system using video-based face recognition. Here input to the system is a video and output is an excel sheet with attendance of the students in the video. Automated attendance system can be implemented using various techniques of biometrics. Face recognition is one of them which do not involve human intervention. In this paper, attendance is registered from a video of students of a class by first performing Face Detection which separates faces from non- faces, and then Face Recognition is carried out which finds the match of the detected face from the face database. If it is a valid match then attendance is registered to an excel sheet.

Attendance being a very necessary side of administration may normally become an arduous, redundant activity, pushing itself to inaccuracies. The traditional approach of making roll calls proves itself to be a statute of limitations as it is very difficult to call names and maintain its record especially when the ratio of students is high. Every organization has its way of taking measures for the Attendance of students. Some organizations use document-oriented Approach and others have implemented these digital methods such as biometric fingerprinting techniques and card swapping techniques. However, these methods prove to be a statute of limitations as it subjects students to wait in a time-consuming queue. If the student fails to bring his id card then he will not be able to get attendance. Evolving technologies have made many improvements in the changing world. The system of intelligent attendance is generally implemented with biometrics help. Recognition of face is one of the Biometric ways of improving this system. Face recognition proved to be a productive method for taking attendance.

The technology aims in imparting tremendous knowledge oriented technical innovations these days. Machine Learning is one among the interesting domain that enables the machine to train itself by providing some datasets as input and provides an appropriate output during testing by applying different learning algorithms. Nowadays Attendance is considered as an important factor for both the student and the teacher of an educational organization. With the advancement of the Machine learning technology the machine automatically detects the attendance performance of the students and maintains a record of those collected data. In general, the attendance system of the student can be maintained in two, different forms namely, Manual Attendance System (MAS) Automated Attendance System (AAS). Manual Student Attendance Management system is a process where a teacher concerned with the particular subject need to call the students name and mark the attendancemanually.

Manual attendance may be considered as a time-consuming process or sometimes it happens for the teacher to miss someone, or students may answer multiple times on the absence of their friends. So, the problem arises when we think about the traditional process of taking attendance in the classroom. To solve

all these issues, we go with Automatic Attendance System (AAS).

AFSM Research Methodology

Activity diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another with different components of activity diagram. Some of the components of activity diagram Start/Stop symbol, Action symbol, Joint and Fork symbol, Decision symbol, Connector symbol.

The database layer is managed using Supabase, which provides a PostgreSQL database for storing user information, student records, subject details, and attendance logs. Cloud-based storage ensures centralized access and data persistence. This architecture allows each component to operate independently while maintaining coordinated communication through RESTful APIs.

Face detection is implemented using Haar Cascade classifiers available in the OpenCV library. Haar features analyze contrast differences between adjacent rectangular regions in an image. These features are evaluated through a cascade of classifiers trained to detect facial patterns. The captured image frame is converted into grayscale to reduce computational complexity

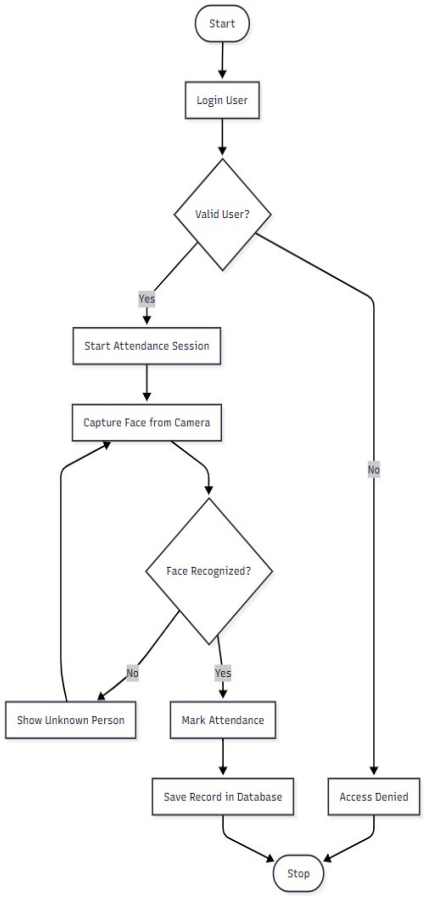

Figure 3.3: AFSM Research Methodology

The Haar Cascade classifier scans the image at multiple scales to identify potential facial regions. Once detected, bounding boxes are generated around each face, which are then extracted for recognition.

The recognition process uses the Local Binary Patterns Histogram algorithm. LBPH works by analyzing the local texture patterns of facial images. For each pixel, the algorithm compares neighboring pixel intensities and generates binary patterns. These patterns are then converted into histograms representing facial features. During training, histograms are generated for each registered student image and stored as part of the trained model. During recognition, the histogram of the detected face is compared with stored histograms. The algorithm calculates a confidence value based on similarity. If the confidence score falls below the predefined threshold,

the student is identified as a match. The LBPH algorithm is selected because it performs efficiently on standard hardware and provides reliable accuracy in controlled classroom environments.

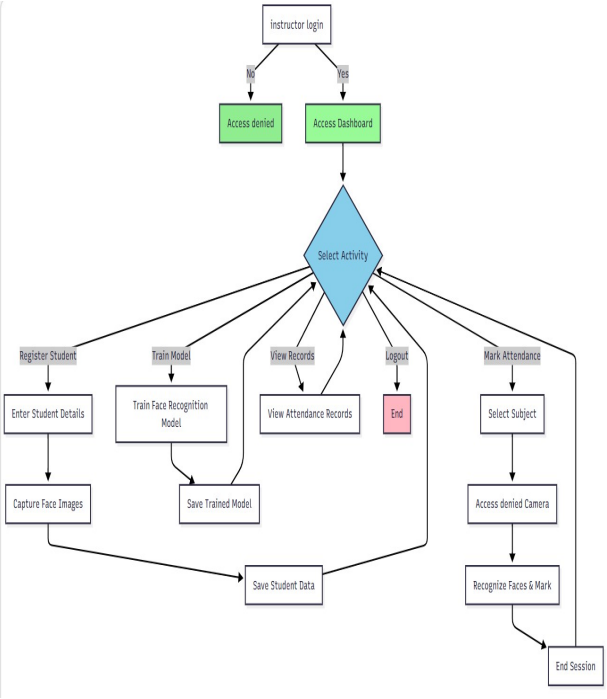

Figure 3.4: Instructor Activity Diagram

The Web-Based Automated Attendance Management System using Face Recognition was successfully implemented and evaluated under real-time testing conditions. The system demonstrated reliable performance in detecting and recognizing student faces and marking attendance automatically with accurate date and time records. The integration of facial recognition using OpenCV with a distributed web architecture ensured smooth communication between the frontend developed using Next.js, the API gateway implemented using Express.js, the backend service built with FastAPI, and the cloud database managed through Supabase. In this paper, the facial feature extraction using AAM, ASM Algorithms with LFPW face databases. In the experimental results, we found that the ASM model is faster and attains more precise traits point location than the AAM model, and AAM model gives a better match to the image texture. There are three key differences between the ASM and AAM algorithms: The AAM attempts to minimise the difference between the target image and the synthesized model image, while the ASM attempts to reduce the distance between model points and the corresponding points found in the image. The AAM employs a model of the appearance of the whole of the region, while the ASM employs models of the texture in small regions around every landmark point.

The algorithm of AfSM model consists of five steps [4]: (i) labeling the points as shown in figure 3. (ii) Eliciting gray profile to all landmarks. (iii) Aligning training set for ASM. (iv) Calculating statistics on aligned training set on PCA at every resolution. (v) Repeat steps from step 1 to step 4 for all resolution level.

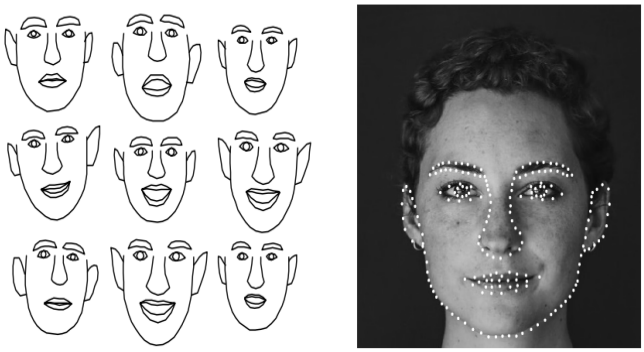

Figure 3.5 Global face shapes: (a) typical training global face shapes consisting of facial features, such as eyes, mouth, nose, eyebrows, and ears (b) model points projected onto training image with a face which produces the global face shapes

API Gateway Implementation

The API gateway serves as an intermediary between the frontend and backend. It forwards requests from the client to the FastAPI service and returns processed responses. This layer enables centralized request

handling, logging, and potential middleware integration for authentication and validation. By introducing a gateway layer, the system achieves loose coupling between frontend and backend components. This improves scalability and simplifies future upgrades or service modifications. The proposed attendance management system follows a multi-tier architecture consisting of four major layers: the frontend layer, the API gateway layer, the backend processing layer, and the database layer. The frontend layer is developed using Next.js and provides the graphical interface for administrators and instructors. It is responsible for user interaction, dashboard display, and initiating attendance sessions. The API gateway layer is developed using Express.js. This layer acts as an intermediary between the frontend and the backend service. It manages routing, request forwarding, and communication between services. By introducing a gateway layer, the system ensures separation of concerns and improved security handling. The backend processing layer is implemented using FastAPI. This layer handles core business logic, face recognition processing, authentication validation, and database interaction. It integrates computer vision algorithms for detecting and recognizing faces.

Unified Modelling Language (UML) is simply another graphical representation of a common semantic model. The proposed system has been designed by using use case diagram, class diagram, sequence diagram, collaboration diagram, state chart diagram and component diagram. The use case diagram consists of the actors and the use cases. The actors of the system are user, system holder, device controller and the use cases are authentication, checking credentials, basic ON/OFF, allow/deny user, storing NLP commands, Input through voice commands, Deriving Data, Intrusion Detection, Service Maintenance. Use Case diagram for Adaptive Automation System (AAS).User and Non-User can login to the device by Admin. Then device controller decides the entry of the user. The user can control the devices through voice commands and these can be monitored by Device Controller.

IV. RESULTS AND DISCUSSIONS

The system must be capable of processing facial recognition requests within a reasonable response time to support real-time attendance marking. The recognition process should operate efficiently under standard classroom lighting conditions. The backend must handle concurrent API requests without significant delay. Database transactions must ensure consistency and prevent duplicate attendance entries. The system should maintain stability during extended classroom sessions.

Class diagram is to model the static view of an application. Class diagrams are the only diagrams which can be directly mapped with object-oriented languages and thus widely used at the time of construction and it is used for general conceptual modelling of the structure of the application, and for detailed modelling translating the models into programming code. Class diagrams can also be used for data modelling. The classes in a class diagram represent both the main elements, interactions in the application, and the classes to be programmed.

The control flow between various participants or entity roles of the corresponding system in the form of messages is represented in the Sequence Diagram. The participants are represented within the rectangular object. The swim line or the lifeline that is dragged below every participant represents the lifetime of the corresponding participant. The UML representation of a class is rectangle containing three compartments stacked vertically. The top compartments shows the class's name. The middle compartments list the class's attributes. The bottom compartment lists the class operations known as the methods of the class. A class diagram consists of any number of classes which will be connected by the lines, which may have arrows at one or both ends, connecting the boxes. These lines

define the relationships, also called associations, between the classes. These lines will have multiplicity torepresent the number of instances of the classes.

Error Handling and Validation

Input validation is implemented at both frontend and backend levels to prevent invalid data submission. Authentication checks ensure that only authorized users can access protected endpoints. The system handles errors such as failed recognition, missing face detection, database insertion errors, and network interruptions. Proper response messages are returned to the frontend to inform the user about system status.

Most machine learning techniques focus on deriving generalized insights from data, including images, which will then be utilized for predictive challenges. Relevant papers are those that assist the user in identifying the solution to an inquiry.

$$Character\_accuracy = \frac{Number\ of\ Characters\ errors}{Number\ of\ Characters}$$

-----(1)

As in our dataset classes are not balanced two kinds of accuracy are used. In the Table 5.3 Accuracy represents usual character accuracy and Accuracy represents equally weighted class accuracy.

$$Precision = RL \frac{Retrieved\ Documents}{Relevant\ Document\ Retrieved}$$

-----(2)

where "*errors*" is a minimum number of edit operations (character insertions, deletions, and substitutions) needed to fully correct the text and "Number_of_characters" is a number of characters in document.

Recall is the second metric. It is the percentage of papers that have been located and are relevant to the query. When a binary classification test correctly detects or excludes a condition, accuracy is used as a statistical measure.

$$Accuracy = \frac{TP+TN+FP+FN}{TP+TN} \quad \text{------- (3)}$$

Table 4.1 gives the performance evaluation of AFSM and NBA are analysed by means of existing method like K-means, Support Vector Machine, Naïve Bayes, and proposed methods are compared with proposed automated term based Fuzzy logic analysis for information retrieval (FCA-IR) and ASFM based sentiment analysis for identifying the image into suitable text format.

Table 4.1 Performance Evaluation of AFSM

Methods	Precision	Recall	CA	Accuracy
SVM	90.34	90.56	91.34	91.26
NBA	92.45	92.67	92.41	92.71
FCA	93.02	93.65	93.12	93.81
AFCM	94.69	94.39	94.26	94.11

The testing phase confirmed that the proposed system meets all functional and performance requirements. All modules functioned correctly both independently and collectively. The distributed architecture operated efficiently without communication failure. The results demonstrate that the system provides reliable, accurate, and automated attendance management suitable for institutional deployment.

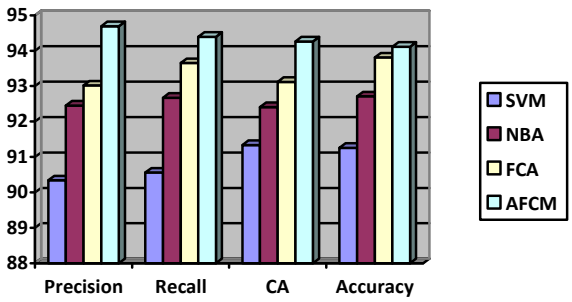

Fig.4.1 Performance Evaluation of AFSM

From the figure the proposed method AFSM gives high accuracy rate while comparing the existing methodology like SVM, NBA and FCA. ASM algorithm just processes data around the model points and does not take all the information obtainable through an object as the AAM algorithm. So ASM model may be less reliable. The model points proceed to be places of interest (borders or angles) where there is the extreme information. We could train the AAM model to just search using information in areas around strong borders; this would need less image sampling through search so a potentially faster algorithm. One feature of the AAM is that we can construct a masked model with a comparatively little number of landmarks. Any additional shape variation is extracted in extra methods of the texture model. The ASM requires points about boundaries so as to set appropriate directions for search. Fewer landmarks are required because the significant work only needs to obtain credible image labelling.

V. CONCLUSION AND FUTURE WORK

The AFSM model samples the image only under the current position, whereas the ASM model searches around the current position, typically along profiles normal to the boundary. In the future work this results can be compared to other Models which concerns with face recognition also the researchers can improving and build a combined model using ASM and AAM model that jointly optimizes a precise traits point location and gives a better match to the image texture. The proposed system successfully automates the attendance marking process using facial recognition technology integrated within a modern web-based architecture. By replacing manual attendance registers and hardware-dependent biometric systems, the project provides a contactless, scalable, and centralized solution for educational institutions. The adoption of a modular architecture ensures separation of responsibilities between user interfaces, API routing, backend processing, and data storage. This design improves maintainability and allows future enhancements without restructuring the entire system. The use of the LBPH recognition algorithm provides efficient and reliable performance under normal classroom conditions without requiring specialized hardware. The system enhances transparency, reduces proxy attendance, and simplifies administrative monitoring. The project demonstrates the practical implementation of artificial intelligence combined with full-stack web development technologies to solve real-world institutional challenges.

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