Mini Project

on

VisiMark - Intelligent Facial Attendance Tracker

Submitted in partial fulfilment of the requirements

of the degree of

Master of Computer Applications

By

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under the guidance of

Supervisor (s):

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Vivekanand Education Society's Institute of Technology

2023-2024

Department of Master of Computer Applications

CERTIFICATE

This is to certify that **Mr. Gautam Shrinivasan, Mr. Pushkar Sane, Mr. Anuj Kadam** of First Year Master Of Computer Applications studying under the University of Mumbai have satisfactorily presented the Mini Project entitled Kisaan Suvidha as a part of the MINI-PROJECT for Semester-I under the guidance of **Dr. Dhanamma Jagli** in the year 2023-2024.

Date:

(Name and sign)   (Name and sign)
Head of Department   Supervisor/Guide

Mini Project Approval

This Mini Project entitled "VisiMark- Intelligent Facial Attendance Tracker"

by **Mr. Gautam Shrinivasan (50), Mr. Pushkar Sane (45), Mr. Anuj Kadam (21)** Of the Class **FY MCA** is approved for the degree of **Master of Computer Applications.**

Examiners

1.….......................................
(Internal Examiner Name & Sign)

2.….......................................
(External Examiner name & Sign)

Date:

Place

Department of Master of Computer Applications

DECLARATION

We, **Mr. Gautam Shrinivasan, Mr. Pushkar Sane, Mr. Anuj Kadam** from **class FYMCA DIV A** declare that this project represents our ideas in our own words without plagiarism and wherever others' ideas or words have been included, we have adequately cited and referenced the original sources.

We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our project work.

We declare that we have maintained a minimum 75% attendance, as per the college norms.

We understand that any violation of the above will be cause for disciplinary action by the Institute.

Yours Faithfully

Gautam Shirnivasan

Pushkar Sane

Anuj Kadam

Acknowledgement

We are thankful to our college Vivekanand Education Society's Institute of Technology for considering our project and extending help at all stages needed during our work of collecting information regarding the project.

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Vivekanand Education Society's
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Abstract

"VisiMark - Intelligent Facial Attendance Tracker" is an innovative and advanced project that aims to revolutionize attendance management in educational institutions. The system addresses the complexities and inefficiencies associated with manual attendance processes, offering an automated and accurate solution through the integration of computer vision techniques and the powerful OpenCV library.

The system's primary objective is to automate the attendance process, eliminating the need for manual recording and reducing the chances of errors or discrepancies.

To facilitate efficient data management, the system integrates with a MySQL database. This centralized database stores student details, attendance records, and relevant information. By storing data in a structured manner, the system enables easy retrieval, analysis, and reporting. It provides administrators with valuable insights into attendance patterns, trends, and statistics, facilitating informed decision-making and monitoring of student attendance.

In addition to meeting the functional requirements, the system fulfils various non-functional requirements. It exhibits a high level of accuracy in face detection and recognition, ensuring minimal false positives or negatives. The system is designed to deliver fast and real-time performance, enabling quick and efficient attendance management during classes or large gatherings. To ensure data privacy and security, the system incorporates stringent measures such as encryption and access control, safeguarding sensitive student information from unauthorized access or misuse.

1. Introduction:

1.1 Introduction:

In the modern educational landscape, "VisiMark" offers a groundbreaking solution to the challenges of attendance management at VESIT. This automated system replaces time-consuming and error-prone manual methods with advanced technology, including facial recognition and machine learning algorithms. By doing so, "VisiMark" enhances efficiency and ensures a seamless experience for both students and administrators.

The project comprises two vital components: a user-friendly frontend and a sophisticated backend. The frontend provides an intuitive interface for students to access their attendance records and allows administrators to effortlessly manage attendance data. The backend component integrates complex logic, such as facial recognition algorithms, with the existing VESIT database system, ensuring a robust and comprehensive solution.

For students, "VisiMark" eliminates the need for manual attendance sign-ins and paper-based records. Facial recognition technology marks attendance in real-time, reducing the possibility of errors or manipulation. Administrators benefit from automated record-keeping and comprehensive reporting, gaining deeper insights into student engagement and attendance patterns.

1.2 Problem statement :

In educational institutions like VESIT (Vivekanand Education Society's Institute of Technology), the traditional methods of attendance management present various challenges. Manual attendance tracking through roll-calls or signature-based systems is time-consuming, error-prone, and lacks efficiency. These methods often result in inaccurate attendance records, which can impact academic reporting and student engagement analysis. To address these challenges, the "VisiMark"; project aims to develop an automated attendance management system that revolutionizes the attendance tracking process and improves overall accuracy.

1.3 Objectives :

1. Automate Attendance Tracking: Develop a system that automates the process of recording student attendance to eliminate manual effort and reduce errors commonly associated with traditional attendance tracking methods.

2. Improve Efficiency: Enhance administrative efficiency by streamlining attendance management processes and providing real-time attendance recording capabilities.

3. Ensure Accuracy and Reliability: Utilize facial recognition technology to ensure accurate identification and verification of students, minimizing the chances of fraudulent attendance records.

4. Enhance Data Management: Implement a robust database system to store and manage student details, attendance records, and related information for easy retrieval and analysis.

5. Simplify User Interaction: Create a user-friendly GUI that allows teachers and administrators to easily interact with the system, record attendance, and access attendance records.

6. Increase Security: Incorporate appropriate security measures to protect student data and ensure privacy, such as encryption techniques and access controls.

7. Facilitate Reporting: Enable the generation of comprehensive attendance reports, including student-wise attendance summaries, percentage calculations, and trends analysis, to assist in decision-making and monitoring attendance patterns.

1.4 Functionalities:

1. User Authentication: Teachers and administrators should have a secure login process within the system, and access to the attendance management features should only be granted with legitimate credentials.

2. Student Registration: Teachers and administrators should be able to register students using the system by obtaining their personal data, including name, ID, and photo.

3. Face Recognition: The detected faces should be recognized by the system and matched with the faces of the pre-registered students.

4. Attendance Recording: Students who have been identified should have their attendance recorded in real time by the system by being marked as "present".

5. Attendance Management: Using the functionalities of the system, teachers and administrators should be able to see, modify, and manage attendance records.

6. Database Integration: In order to safely store and manage student profiles, attendance records, and related data, the system should interface with a MySQL database.

7. User Interface: For teachers or administrators to access and handle attendance management responsibilities with ease, the system should feature an easy-to-use and simple interface.

1.5 Scope:

The scope of the online attendance system is to provide a software solution that can help educational institutions to manage and monitor the attendance of their students and staff in an efficient and effective way. The online attendance system can have a positive impact on the quality and efficiency of education, by ensuring the regularity and punctuality of students and staff, and by providing them with useful feedback and insights. It can produce various reports and analytics, such as class-wise, subject-wise, or month-wise attendance, which can help in identifying the attendance patterns and trends.

2. Literature Survey

2.1 Survey of Existing systems:

1. Traditional Manual Systems: Educational institutions often rely on error-prone manual methods, including paper-based registers and manual spreadsheet entries, leading to time-consuming processes and inaccurate attendance records.

2. Barcode & RFID Systems: Some institutions use barcode or RFID systems, involving scanning for attendance. While more efficient than manual methods, these systems require physical contact and are prone to errors if codes or cards are lost or damaged.

3. Biometric & Facial Recognition Systems: Biometric-based systems, using fingerprint or iris recognition, offer reliability but may face challenges in poor lighting and hygiene concerns. Automated facial recognition systems, utilizing OpenCV-based algorithms, provide a non-intrusive and contactless approach, eliminating the need for physical cards or biometric scans.

4. Commercial Attendance Software: Various commercial software solutions offer attendance management features, including data analytics, reporting, and integration with student information systems. The accuracy and performance of facial recognition capabilities in these systems may vary.

2.2 Limitations of Existing systems:

1. Enhanced Accuracy in Challenging Conditions: Research ways to improve accuracy in challenging conditions like low lighting, occlusions, facial expressions, and poses. Explore techniques such as adaptive illumination normalization, multi-modal fusion, and pose-invariant algorithms.

2. Real-Time Scalability and Performance: Develop systems for efficient real-time attendance tracking in large-scale scenarios. Address challenges in data processing, storage, and network communication for seamless performance. Explore distributed computing, cloud solutions, and optimization algorithms for enhanced scalability and response time.

3. Ethical & Privacy Considerations: Research ethical and privacy implications in educational settings. Establish best practices for consent, data security, bias mitigation, and legal compliance. Explore privacy-preserving techniques like differential privacy to address concerns and build trust.

4. User Friendly Interfaces & Accessibility: Design user-friendly interfaces for teachers, administrators, and students. Consider ease of use, intuitive navigation, and accessibility for individuals with disabilities. Incorporate user-centered design studies, stakeholder feedback, and universal design principles.

5. User Friendly Interfaces & Accessibility: Research seamless integration with existing systems like student information or learning management systems. Develop standardized data formats, APIs, or interoperability protocols for data exchange.

2.3 Mini project contribution:

An online attendance management system can offer numerous benefits to organizations, educational institutions, and businesses. Here are some contributions of such systems:

- Efficiency and Accuracy:
  - o Automation: Online attendance systems automate the process of recording attendance, eliminating the need for manual data entry. This reduces the chances of errors associated with manual attendance tracking.
  - o Real-time Updates: Provides real-time updates on attendance, allowing for quick and accurate insights into employee or student attendance status.
- Time Savings:
  - o Streamlined Processes: Reduces administrative burden by streamlining attendance tracking processes. This allows administrators and teachers to focus on other important tasks.
- Accessibility:
  - o Anywhere, Anytime Access: Users can access the system from anywhere with an internet connection. This is particularly useful for remote work or for educational institutions with online learning programs.

3. Analysis and Design

3.1 Analysis of the system

1. User Interface (UI) and User Experience (UX):

The UI component is responsible for providing a user-friendly interface for teachers and administrators to interact with the system. It allows them to perform tasks such as student registration, attendance recording, and managing attendance records. The UI may be developed using Tkinter, a Python library for creating graphical user interfaces.

2. Face Detection Module:

This module incorporates the Haar-Cascade Classifier algorithm to detect faces in real-time from video streams or images captured by the camera. It analyzes the video frames and identifies regions of interest that potentially contain faces. The face detection module utilizes the OpenCV library for efficient and accurate face detection.

3. Database Management System:

The system integrates with a MySQL database to store and manage student profiles, attendance records, and related information. The database management system ensures secure and efficient data storage, retrieval, and management. It allows for the storage of student details, including their names, IDs, photographs, and attendance records.

4. Attendance Management Module:

This module handles the recording and management of attendance records. It captures the attendance of recognized students in real-time, marks them as "present," and stores the timestamp of each attendance entry. The module also provides functionalities for teachers and administrators to view, edit, and generate reports based on specific time periods, courses, or individual students.

5. Integration and Communication:

The different components of the system communicate and exchange data seamlessly. The face detection module provides the detected face images to the face recognition module for identification. The attendance management module retrieves student information and attendance records from the database for display and processing.
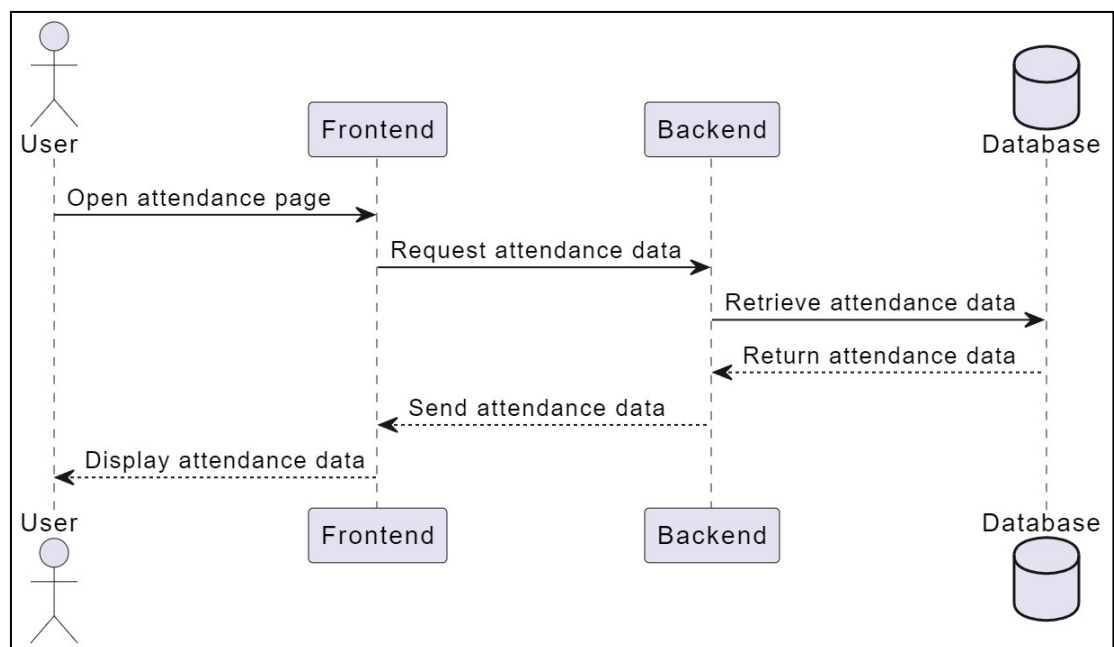
3.2 Proposed Solutions (ER Diagram)
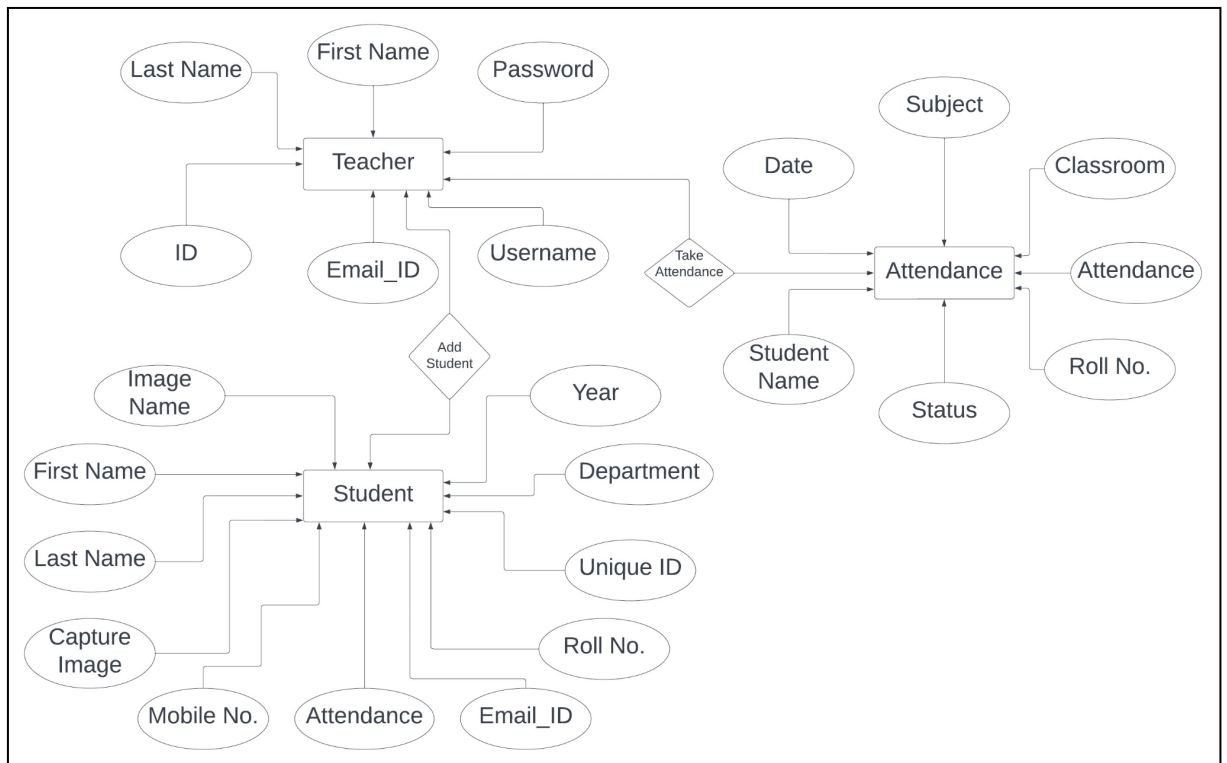
3.3.1 Architecture/ Framework Design of the proposed system
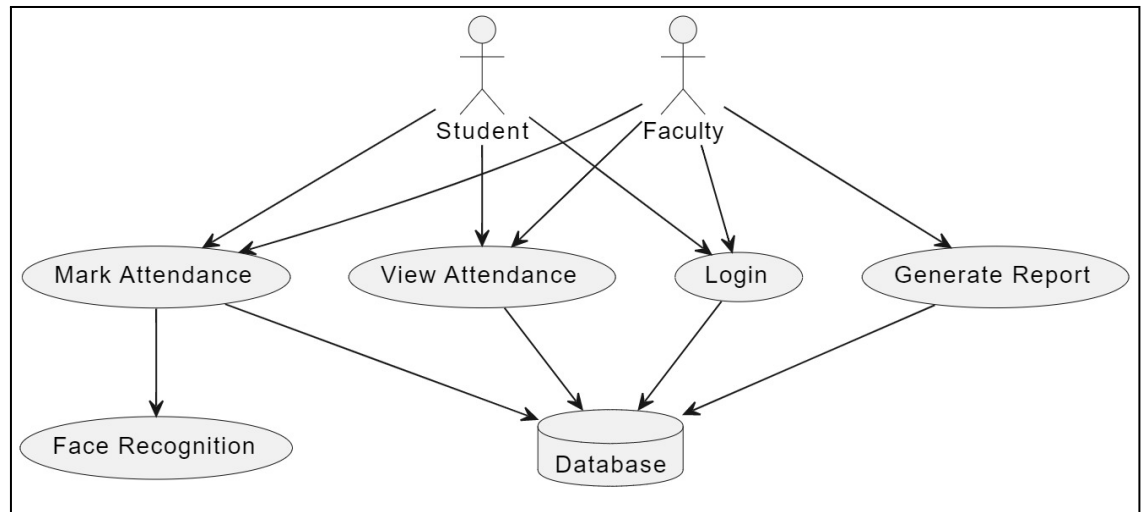
3.3.1.1 System Architecture
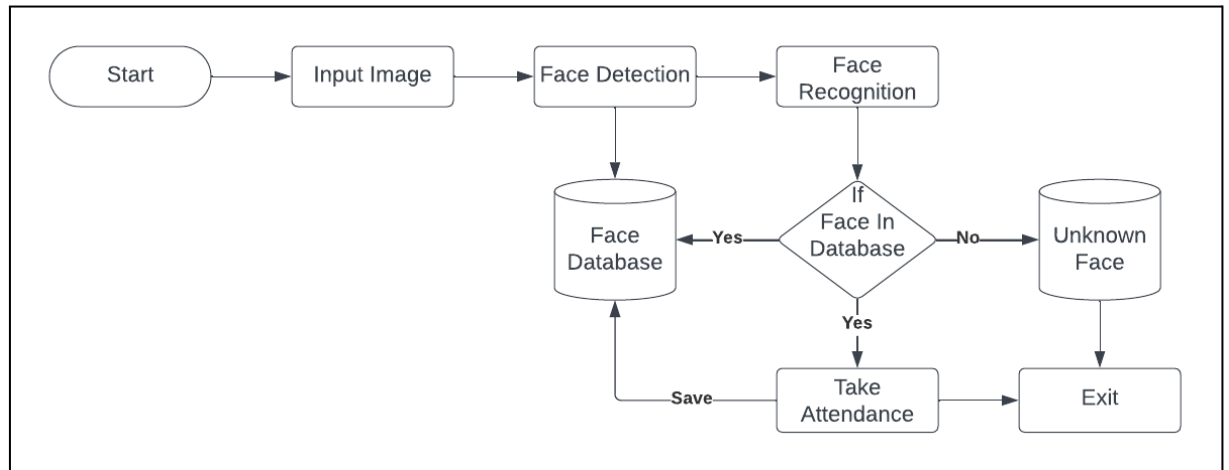
3.3.1.2 Sequence Diagram

3.3.2 Algorithm and Process Design

3.3.2.1 Use case diagram

3.3.3 Details of Hardware & Software

Hardware:

CPU	X86_64 architecture with a clock speed of 1.6 GHz
Memory	4GB
Disk Space	8GB

Software:

Frontend	React, Html, CSS
Backend	Node.JS, Python
Database	SQL
Frameworks and Libraries	OpenCV

3.3.4 Experiment and Results (Code and GUI)

Code:
GUI :
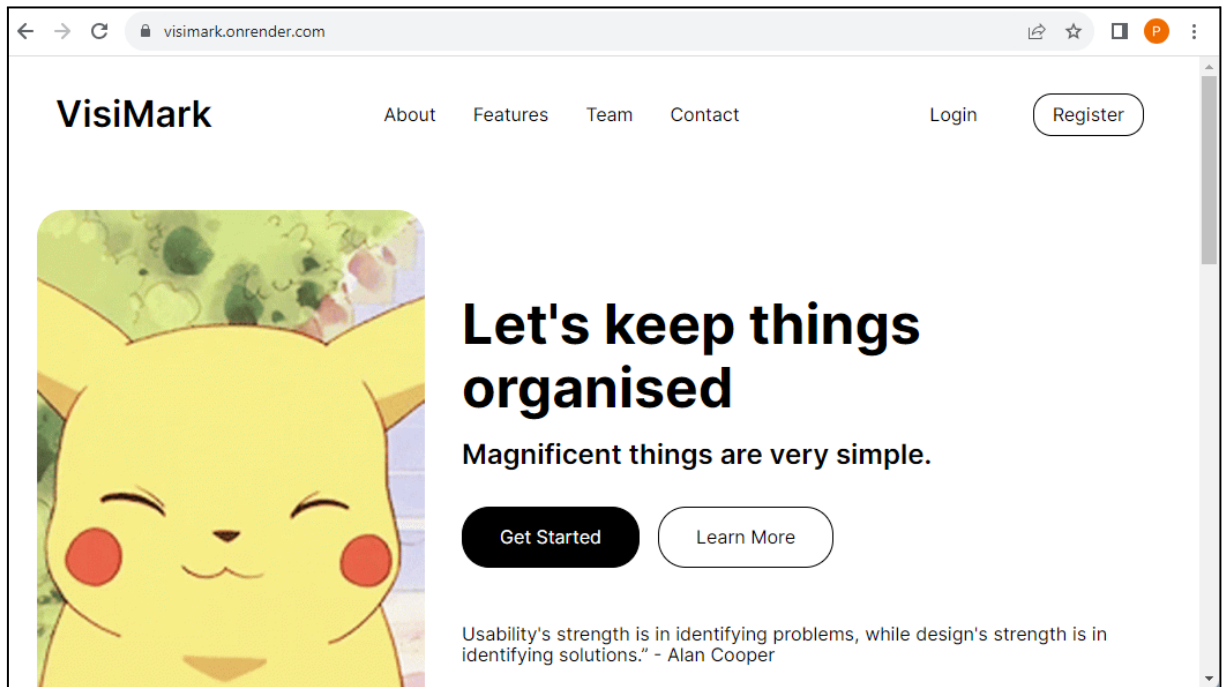
4. Conclusion and Future Work

Conclusion:

In this project, we developed the "VisiMark - Intelligent Facial Attendance Tracker," a sophisticated and innovative solution to address the challenges associated with manual attendance management in educational institutions. By leveraging advanced computer vision techniques and the powerful OpenCV library, the system revolutionizes the traditional attendance tracking process, resulting in improved accuracy, efficiency, and convenience.

Future Work:

The "VisiMark - Intelligent Facial Attendance Tracker" project has its potential as an innovative solution for attendance management in educational institutions. While the current implementation has significant milestones, there are several areas of future development and enhancement that can be explored to further improve the system's functionality and address emerging needs.

5. References:

1. J. W. S. D'Souza, S. Jothi and A. Chandrasekar, "Automated Attendance Marking and Management System by Facial Recognition Using Histogram," 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS), Coimbatore, India, 2019, pp. 66-69, doi: 10.1109/ICACCS.2019.8728399.

2. E. Varadharajan, R. Dharani, S. Jeevitha, B. Kavinmathi and S. Hemalatha, "Automatic attendance management system using face detection," 2016 Online International Conference on Green Engineering and Technologies (IC-GET), Coimbatore, India, 2016, pp. 1-3, doi: 10.1109/GET.2016.7916753.

3. H. Rathod, Y. Ware, S. Sane, S. Raulo, V. Pakhare and I. A. Rizvi, "Automated attendance system using machine learning approach," 2017 International Conference on Nascent Technologies in Engineering (ICNTE), Vashi, India, 2017, pp. 1-5, doi: 10.1109/ICNTE.2017.7947889.

4. https://opencv.org/about/

5. https://becominghuman.ai/face-detection-using-opencv-with-haar-cascade-classifiers-941dbb25177

6. https://pyimagesearch.com/2021/05/03/face-recognition-with-local-binary-patterns-lbps-and-opencv/

7. https://www.researchgate.net/publication/326261079_Face_detection_system_for_attendance_of_class'_students

8. https://www.javatpoint.com/face-recognition-and-face-detection-using-opencv