

Novel Approach to Monitor Location of the Student in the Institution

R. N. Kulkarni¹, Rochana Suma Y², B Sravanthi³, G Rakshitha⁴ and T Krathika⁵

¹⁻⁵Ballari Institute of Technology and Management, Dept. of Computer Science & Engineering, Ballari, India
rnkulkarni@bitm.edu.in, rochanasuma2003@gmail.com, sravanthisravs076@gmail.com, rakshithagaduputi@gmail.com, ka5krati@gmail.com

Abstract— During the last few decades there is a tremendous growth in the information and communication technology wherein many organizations are making use of the hardware and software for various applications. Marking the attendance of a student in the school or college as well as the presence of the employee in the workplace is to be either captured or manually marked in the registers. Performing various analyses by taking the manual input is cumbersome because the number of students in the class or number of employees in the organizations are increasing. To overcome the difficulties of managing the things manually in this paper we are proposing an automated tool to capture the presence of the student in the specific location. This paper proposes a novel approach to mark the presence of a student in the college premises. The tool developed here is an Android Application (App) wherein the students can send the details to the App. Two modules are proposed here, one for the student and another for the Administrator. Through the student module, each student can login to the App and capture the self-image and send it to the Administrator Module. The captured image comprises the GPS details like Longitude, Latitude, Time, and date information. The information sent through the App determines the location of the student whether the student is in the college premise such as Class room, Laboratory and Library. The application which is managed by the teacher or the administrator or proctor will get the details about the student's image, GPS locations such as latitude, longitude, date and time. The mobile app verifies the GPS location and image of the student and compares it with the database. If the captured information matches with the appropriate GPS location then the students attendance is marked as present in that particular duration and appropriate files are updated.

Index Terms— Mobile Application, Smart roll-call, Recording Attendance, Capturing Image, Face recognition.

I. INTRODUCTION

During the last few decades there is a tremendous growth in the information and communication technology wherein many organizations are making use of the hardware and software for various applications. Marking the attendance of a student in the school or college as well as the presence of the employee in the workplace is to be either captured or manually marked in the registers. Performing various analyses by taking the manual input is cumbersome because the number of students in the class or number of employees in the organizations are increasing. To overcome the difficulties of managing the things manually in this paper we are proposing an automated tool to capture the presence of the student in the specific location. The above difficulties motivated us

to develop an automated tool to handle the problems related with marking the presence of a student or employee in a specific location in the organization. A smart attendance system with face recognition and location tracking utilizes advanced technologies to streamline attendance management. Here are key features facial recognition uses facial biometrics for unique identification which is shown in Fig 1. Reduces the likelihood of buddy punching or fraudulent attendance. Location tracking utilizes GPS or geofencing technology to verify the user's or student's presence. Adds an additional layer of authentication based on the user's physical location. Real-time monitoring provides instant updates on attendance status. Enables timely intervention for any discrepancies or issues. Mobile Accessibility Allows lectures to mark attendance through a mobile app. Enhances flexibility, especially for remote or field-based workers. Automation and Integration Automates attendance recording, reducing manual effort and errors. Integrates with HR systems for seamless data flow and reporting. The Security & Privacy prioritizes data security to protect facial biometrics and location information. The privacy regulations ensure the user confidentiality. Analytics and Reporting Generates detailed reports on attendance patterns. Facilitates data-driven decision- making for workforce management. User-friendly Interface Provides an intuitive interface to administrators and users. Enhances the adoption of user and overall system effectiveness. Implementing such a system can optimize attendance processes, enhance accuracy and contribute to a more efficient and transparent institutional environment.

In today's dynamic institutional landscape, efficiently monitoring the location of students is crucial for security, collaboration, and resource optimization. This novel approach leverages advanced technologies and data analytics to provide real-time insights into the whereabouts of individuals within the institution. By integrating cutting-edge location tracking solutions with seamless data processing, this system aims to enhance institutional efficiency and responsiveness. This introduction sets the stage for exploring the innovative methods and benefits of monitoring student's locations in a modern workplace. It helps teachers to manage attendance of each student in the classroom, laboratory in the easiest way. This mobile application can be used by any college by registering and installing the App. The App supports customized reports in the form of Microsoft Excel sheets through which the teacher can analyze the student's data i.e. how many students are attending the classes /laboratory and how many students are absent. The pattern of absentees is further analyzed which helps to take necessary actions. The Application sends a reminder to all the students a few minutes before the commencement of the class. The accurate way to record the attendance of students is by capturing the facial image. This approach is comparatively fast and optimized because nowadays every student is having a smartphone. No additional cost and devices are required to perform this task.

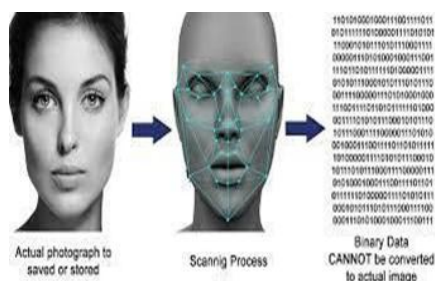


Fig 1: Face Recognition System



Fig 2: Location Based Attendance System

II. LITERATURE SURVEY

The paper [1] narrates on how a "face recognition-based attendance monitoring system" works. The purpose is to evaluate the attendance of the student in the educational institution. The system uses a face- recognition-based approach to track students' attendance. The system requires students to sign up initially and follows the procedure as per the application. The python programming language is used to implement the application.

According to this paper [2] the author discussed the Automated attendance system with the workflow. It uses QR technology that will simplify the attendance process, by generating and scanning QR for attendance. The system is based on QR Technology and runs on mobile as an application.

The paper [3] proposes a method which uses an Arduino board and microcontroller to monitor the attendance. This project aims to design a smart attendance of students in an institution. WIFI communication modules are used to make convenient communication depending on the availability of the network.

This paper [4] narrates on how a "Smart attendance system using Machine Learning" works. The motive of the software is to develop a biometric participation framework using reasonable methodologies and readily available

data. The paper depicts the idea along with a logical facial recognition approach. This product project makes use of various important Dot Net APIs to collaborate and obtain the results of a nearby camera.

In this paper [5] the proposed system will be more secure for users if fingerprints are used. This provides a practical approach for students to access the Internet Of Things. The attendance is recorded using a biometric fingerprint Scanner and details will be stored in the cloud. Since each fingerprint is unique and collected, the fingerprint database can also be used in identity management and access control applications.

According to this paper [6] the author discussed face identification plays a major role in several applications including attendance management and access control systems. There are several techniques in automated human identification such as RFID, Eye Tracking, Voice Recognition. This literature survey focuses on a specific contribution to the domain and attendance system leveraging deep learning convolutional neural networks (CNNs). The approach adopted involves transfer learning, utilizing three pre-trained CNNs that are subsequently fine-tuned on the specific dataset. The results indicate a commendable performance, showcasing high prediction accuracy and reasonable training time.

In this paper [7] literature survey introduces an approach to the detection and identification of human faces, outlining a near-real-time face recognition system that tracks a subject's head and identifies individuals by comparing facial characteristics with known profiles. The methodology treats face recognition as a two-dimensional problem, capitalizing on the inherent upright orientation of faces.

The paper [8] the proposed system relies on face recognition technology to streamline attendance tracking for students. The system operates by recording daily attendance subject-wise, a task pre-allocated by the administrator. Upon the commencement of each subject, the system autonomously captures images, employing face detection and recognition techniques. Recognized students are subsequently marked as present, and their attendance records are updated with corresponding timestamps and subject IDs.

According to this paper [9] the proposed system aims to automate the recording of student attendance in a classroom setting, leveraging the precision of face recognition. The integration of the PCA algorithm enhances the accuracy and efficiency of the recognition process. This automated system not only captures attendance data but also provides faculty members with convenient access to student information. The system maintains a log detailing clock-in and clock-out times, facilitating easy tracking and management of attendance records.

This paper [10] investigates the efficacy of human and computer-based identification of human faces through subjective feature descriptions such as long ears and wide-set eyes. Three sets of experiments are detailed: 1) Data collection, analysis, and assessment of face-feature data for 255 faces. 2) Computer identification studies. 3) Human identification studies. An initial set of features, reduced to 22 relevant and distinctive measures, was developed for reliable subjective judgments.

According to this paper [11] the literature survey explores a groundbreaking method for efficiently recording class attendance. By utilizing a deep convolutional neural network (CNN) for face recognition, the system processes live video frames to identify students. Extracting 128-dimensional face encodings, it compares them with a stored dataset to mark attendance automatically. This innovative approach resolves existing challenges, signaling a futuristic advancement in attendance management.

In this paper [12] the literature survey discusses a "Smart Attendance System for Face Recognition" designed to tackle attendance issues in educational institutions. Utilizing face recognition technology and the Local Binary Pattern Histogram algorithm, it aims to eradicate proxy attendance. Implemented in Python and Visual Studio with Tkinter interface, ensuring dependable attendance tracking and authentication.

According to this paper [13] the literature survey underscores the significance of attendance tracking in educational institutions and workplaces for monitoring progress and workload. Manual logging methods, often prone to errors, are highlighted as inefficient. To address this, the paper introduces an autonomous attendance logging system utilizing RFID and Raspberry Pi technology. This system aims to streamline attendance processes, allowing institutions and instructors to prioritize academic endeavors.

In this paper [14] the literature review emphasizes the importance of facial recognition-based attendance systems in contemporary institutions. Highlighting the system's reliance on building a database of individuals' faces via camera inputs, it employs a recognizer algorithm for attendance monitoring. Utilizing PCA and CNN for facial recognition, the system cross-references acquired face images with the database, automatically recording attendance in an Excel sheet upon identification.

The paper [15] introduces a smart attendance system employing real-time face recognition to streamline student attendance management. It identifies shortcomings in traditional attendance methods and advocates for facial recognition technology's advantages. Utilizing high-definition cameras and computer algorithms, the system achieves rapid and precise student face recognition. The objective is to establish an automated attendance management solution tailored for educational institutions.

The paper [16] highlights the inefficiency of manual student attendance processes in educational institutions. It proposes a biometric attendance system leveraging IoT technology, specifically facial recognition, to streamline attendance recording and data storage. Employing a Raspberry Pi camera, the system captures and compares student face images with stored database images, aiming to enhance teaching efficiency.

III. PROPOSED METHODOLOGY

Database Creation

Establish a comprehensive database to manage student enrollment within the classroom or laboratory. Key details such as University Serial Number (USN), Name, classroom, and Section will be stored. Additionally, an innovative feature involves capturing student images from input videos, cropping and saving these images in a designated folder.

Face Detection

In this step, the process begins by utilizing existing software to process an operational video. The initial frame is selected for further analysis. Employing the Viola-Jones algorithm, renowned for its effectiveness even in low-light conditions, the system detects student faces. Originally designed for object detection, this algorithm has proven instrumental for facial recognition, including challenging environments.

Feature Extraction

After successful face detection and alignment, the subsequent step involves feature extraction. This paper employs the Convolutional Neural Network (CNN) algorithm to extract distinctive features from input images, enhancing the precision of facial recognition.

Face Recognition

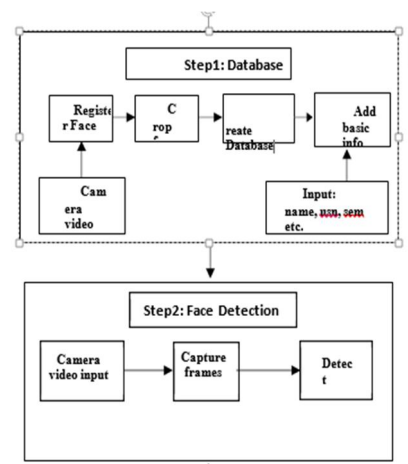
During the live video processing phase, a cutting-edge deep CNN face recognition algorithm is employed. This algorithm extracts 128-dimensional face encodings from images, facilitating precise comparison with stored dataset faces. This meticulous matching process accurately records student attendance in the classroom or laboratory.

Location Verification

To check whether the student or concerned faculty is within the classroom or desired premises. The latitude and longitude from the picture is recorded and compared with longitude and latitude of the classroom. If it is in the specified range then the student is marked present, otherwise he/she is marked absent.

Report Generation

The system generates final reports in Excel format, ensuring a comprehensive record for future analysis. These reports prove valuable across various subjects and sessions. Additionally, at the end of the semester, the system calculates the total percentage of student attendance, aiding in predictions regarding eligibility for upcoming exams.



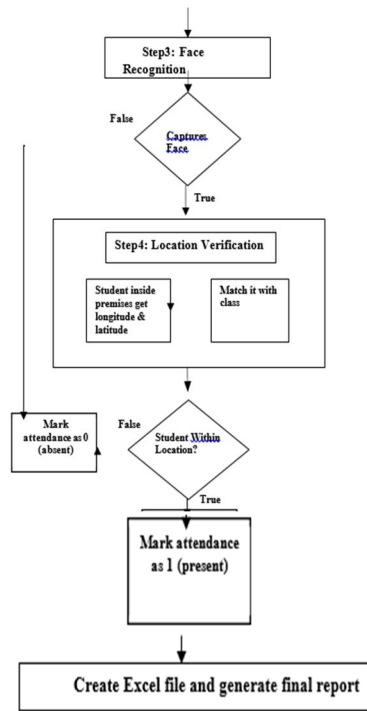


Fig 3: Flow Chart of recording attendance and generating final report

IV. RESULTS AND DISCUSSIONS

A novel approach to monitor student's locations in an institution could involve using a combination of IoT devices, geolocation technologies, and a centralized platform. This could enhance security, streamline communication, and optimize resource allocation. The project's scope would encompass developing a robust system, ensuring privacy compliance, and assessing the impact on institutional efficiency and employee satisfaction.

TABLE I: FINAL REPORT OF ATTENDANCE IN AN EXCEL FORMAT

ROLL NUMBER	USN	NAME	GPS INFORMATION
01	3XX20XX001	AISHWARYA	Ballari, Karnataka, India 5V92+9453, Ballari, Karnataka Lat 15.168418° Long 76.8503° 22/03/24 12:45 PM
02	3XX20XX002	ASHOK	Ballari, Karnataka, India 5V92+9453, Ballari, Karnataka Lat 15.168418° Long 76.8503° 22/03/24 12:45 PM
Total No Presents			
Total No Absentees			

The proposed tool monitors each person's GPS location in the institution. If the person's location matches with the location of the institution, then his presence is recorded, otherwise the absence is marked in table 1. This table is further used for various purposes in the institution.

V. FUTURE SCOPE & LIMITATION

An assortment of future scope is accessible that can be utilized by developing a novel approach to monitor the

location of the student in the institution based on face detection and location. This system is fully dependent on the internet. If the internet service is not available then the system is not able to capture the required information. It is designed to solve the issues of the existing manual system by capturing the face of a person. It helps in accuracy and speed ultimately to achieve the high-precision real-time attendance and its evaluation process.

VI. CONCLUSION

This paper proposes a novel approach to monitor and record the presence or absence of students in the classroom or laboratory. Individual students have to scan the face and upload it to the app. The tool verifies the latitude and longitude of the image and if it matches the latitude and longitude of the institution then it is marked as present otherwise it is treated as absent. The system also records the entries in the excel file which can be used in future for further analysis. The tool developed here is tested by considering the images which consist of Geotagged information and get the expected results.

REFERENCES

- [1] Dr. V Suresh, Srinivasa Chakravarthi Dumpa..., "Facial Recognition Attendance System Using Python and OpenCV" Published in the Journal of Software Engineering and Simulation Volume 5 ~ Issue 2 (2019) pp: 18-29 ISSN(Online) :2321-3795.
- [2] Harshad Sutar, Suyash Chaudhari, Pritam Bhopi, Dipashri, Sonavale "Automated Attendance System" Published in the International Research Journal of Modernization in Engineering Technology and Science.
- [3] Shweta S Bagali, Dr. K Amuthabala, Iranna Amargol, H Prajwal, 2022..., "Smart Attendance System using Machine Learning" Published in the International Journal of Engineering Research & Technology (IJERT) RTCSIT – 2022 (Volume 10 – Issue 12).
- [4] Priyanka Pimpalkar*1, Anand D. G. Donald*2..., Literature Review On "Face Recognition System Based On Deep Learning" Published in the International Research Journal of Modernization in Engineering Technology and Science.
- [5] k. Jayakumar, V sunendar, A sheela, P Javagar, K Dhanush "Internet of Things based Biometric Smart Attendance System" published in the 2022 International Conference on Sustainable Computing and Data Communication Systems IEEE (ICSCDS) DOI:10.1109/ICSCDS53736.2022.9761045.
- [6] Khawla Alhanaee, Mitha Alhammadi, Nahla Almenhali, Maad Shatnawi "Face Recognition Smart Attendance System Using Deep Transfer Learning" published in the journal Elsevier Procedia computer science volume 192,2021,pages 4093-4102.
- [7] M. A. Turk, A. P. Pentland..., "Face recognition using Eigenfaces" published by IEEE journals 1991 IEEE Computer Society Conference on Computer Vision and Pattern Recognition DOI: 10.1109/CVPR.1991.139758.
- [8] Kaneez Laila Bhatti1,*, Laraib Mughal1, Faheem Yar Khuhawar1, Sheeraz Ahmed Memon11Dept. of Telecommunication Engineering, MUET, Jamshoro, PK...,1 "Smart Attendance Management System Using Face Recognition" Research article EALEU DOI:10.4108/eai.13-7-2018.159713.
- [9] Nirmalya kar,Dr.Mrinal kanti Deb Barma,Ashim saha..., "Study of implementing automated attendance system using face recognition" published in the International journal of Computer and Communication Engineering DOI : 10.7763/IJCE.2012.V1.28.
- [10] j. Goldstein, L. D. Harmon, A. B. Lesk..., "Identification of human faces" published by IEEE journals DOI:10.1109/PROC.1971.8254.
- [11] R N Kulkarni, Anjali T S S L, Rohit B, Veeresh S, Raghuveer Nadagouda..., "Novel Approach To record The Attendance Of Students Using Facial Recognition" published in the ICDCECE 2023, DOI:10.1109/ICDCECE 57866.2023.10150539.
- [12] Tatukuri Charishma; K Pranathi; Terli Niharika; "Smart Attendance System with and Without Mask using Face Recognition" 2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS) DOI: 10.1109/ICAIS56108.2023.10073686.
- [13] F Antony Jeffrey Vaz; G AnusuyaDevi; A Mohana Indhu Priya; R Yamini Rajam; Karthik Kumar K; "Smart Attendance System using RFID and Raspberry Pi" 2023 Second International Conference on Electronics and Renewable Systems (ICEARS) DOI: 10.1109/ICEARS56392.2023.10085186.
- [14] Vineet Kumar Chauhan; Trilok Singh; Abhishek Dixit; Raushan Kumar Singh; Pradeep Kumar Singh Juginder Pal Singh; "Image-Based Attendance System using Facial Recognition" 2022 11th International Conference on System Modeling & Advancement in Research Trends (SMART) INSPEC Accession Number: 22683381 DOI: 10.1109/SMART55829.2022.10047785.
- [15] Ashish Yadav; Aman Sharma; Sudeept Singh Yadav "Attendance Management System Based on Face Recognition Using Haar-Cascade" 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE) INSPEC Accession Number: 21884931 DOI: 10.1109/ICACITE53722.2022.9823613.
- [16] Manoj A. Patil; Khyamling Parane; D D Sivaprasad; Shivananda Poojara; Manjunath Ramanna Lamani "Smart Attendance Management System using IoT" 2022 Second International Conference on Computer Science, Engineering and Applications (ICCSEA) INSPEC Accession Number: 22239233 DOI: 10.1109/ICCSEA54677.2022.9936433.