FaceTrack – Face ID Based Academic Management System

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Abstract — In many colleges, academic attendance is still recorded manually, which often leads to er rors, time wastage, and difficulty in maintaining records. To overcome these problems, this project presents a FaceTrack System that manages attendance digitally and also moni tors attendance data during lab sessions. The system is developed using Python with a simple graphical interface and uses a SQLite database to store all information. It allows students to log in and mark their attendance by selecting the practical they are performing. Once attendance is marked, the system automatically creates a session and records the login time. An important feature of this system is attendance analytics. While the student is working on the computer, the system tracks the face recognition or application being used and stores this information in the database at regular intervals. This helps teachers understand whether students are using the system for academic purposes or not. The system also provides access to teaching assistants and course incharge, who can view attendance records and manage academic attendance and student records. Reports can be generated in formats like CSV and PDF, making it easier to analyze and maintain records.

Keywords: Face Recognition Attendance System; Digital Attendance Management; Attendance Analytics; Student Activity Monitoring; SQLite Database Management; Academic Record Automation;

I. INTRODUCTION

Laboratory sessions are an important part of education, but attendance is often recorded manually, which can lead to errors and time wastage. Managing records and checking student participation becomes difficult using traditional methods. The FaceTrack System is developed to automate attendance and manage academic attendance and student records during lab sessions. It provides a digital platform where students can mark atten dance, and their activity on the system is recorded. This helps improve accuracy, saves time, and ensures better use of laboratory resources.

The Software Requirements Specification (SRS) describes the overall requirements of the FaceTrack System. This system is developed to automate academic attendance and manage academic attendance and student records during lab sessions. The document provides details about system features, user roles, constraints, and overall system functionality.

In modern educational institutions, laboratories play a vital role in providing practical knowledge and hands-on experience to students. Laboratory sessions are essential for subjects related to computer science, information technology, electronics, engineering, and other technical domains. However, despite the advancement of digital technologies in education, many colleges and universities still rely on traditional manual methods for recording academic attendance and monitoring student participation. These methods generally involve paper registers or spreadsheets maintained manually by faculty members or laboratory assistants. Such approaches are often inefficient, time-consuming, and prone to human errors. The proposed FaceTrack System contributes to the digital transformation of educational laboratories by improving transparency, efficiency, and accountability. By integrating attendance management with attendance analytics and effective laboratory Supervision.

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Manual attendance systems create several challenges in academic environments. Faculty members spend a significant amount of time verifying student presence, updating records, and preparing attendance reports. In large laboratories with many students, maintaining accurate records becomes difficult. Students may also misuse the manual system through proxy attendance or unauthorized access to laboratory resources. Furthermore, conventional attendance systems only record whether a student is present or absent, without providing information about the actual activities performed during the laboratory session. As a result, teachers cannot effectively monitor whether students are genuinely engaged in academic tasks or using the laboratory systems for unrelated activities.

To address these challenges, the proposed project introduces a FaceTrack System, an integrated digital platform designed to automate academic attendance management and manage academic attendance and student records during practical sessions. The system is developed using Python for the application layer and SQLite as the backend database for secure storage and management of information. A user-friendly graphical interface enables students, teaching assistants, and faculty members to interact with the system efficiently.

The FaceTrack System allows students to log into the laboratory system using their credentials and mark attendance by selecting the practical experiment or session they are performing. Once the attendance is marked, the system automatically creates a laboratory session and records important details such as login time, session duration, and selected practical. This automated mechanism eliminates manual errors and ensures reliable attendance records.

A. Motivation

The rapid growth of digital technologies has transformed many sectors, including education. Educational institutions are increasingly adopting smart systems to improve administrative efficiency, reduce manual work, and enhance the overall learning environment. However, academic attendance management in many colleges still depends on outdated manual processes. This gap between technological advancement and traditional management practices motivated the laboratory development of the FaceTrack System.

The increasing need for transparency and accountability in educational institutions also motivated this work. Faculty members and administrators require accurate digital records for attendance verification, performance evaluation, accreditation processes, and academic audits. Automated report generation and centralized data management can significantly simplify these processes.

Furthermore, the availability of affordable software technologies such as Python, SQLite, and GUI frameworks has made it possible to develop cost-effective smart management systems without requiring expensive infrastructure. The integration of database management, user authentication, activity tracking, and report generation into a single system can greatly enhance laboratory administration.

B. Literature Survey

Attendance management and attendance analytics systems have become important areas of research in educational technology due to the increasing demand for automation, security, and efficiency in academic institutions. Researchers have proposed various techniques and systems to improve attendance tracking and monitor user behavior in laboratory environments. This section discusses existing methods, technologies, and their limitations.

Traditional attendance systems primarily rely on manual entry methods where teachers record attendance in paper registers. Although this method is simple, it suffers from several disadvantages such as time consumption, data redundancy, calculation errors, and difficulty in maintaining historical records. To overcome these issues, many institutions adopted computerized attendance systems using spreadsheets or standalone applications. However, these systems still require manual input and lack real-time automation.

Biometric attendance systems emerged as a popular solution for improving attendance accuracy. Fingerprint recognition systems are widely used in schools, colleges, and organizations due to their ability to uniquely identify individuals. These systems reduce proxy attendance and improve reliability. However, biometric systems often require specialized hardware, regular maintenance, and higher installation costs. Additionally, biometric systems generally focus only on attendance recording and do not manage academic attendance and student records during laboratory sessions.

RFID-based attendance systems represent another advancement in automated attendance management. In such systems, students carry RFID-enabled identity cards that are scanned automatically when entering the laboratory or classroom. RFID systems improve speed and convenience but can still face issues such as card sharing, hardware dependency, and security vulnerabilities.

Face recognition-based attendance systems have gained popularity due to developments in computer vision and artificial intelligence. These systems use cameras and machine learning algorithms to identify students automatically. While they provide contactless attendance recording, they require high-quality image processing, stable lighting conditions, and strong computational resources. Privacy concerns and implementation complexity also limit their widespread adoption.

Several web-based attendance management systems have also been proposed to centralize academic records and enable remote access. These systems provide online attendance management, reporting, and administrative control. However, many existing systems focus only on attendance storage and lack advanced monitoring capabilities.

Research in academic classroom monitoring systems has introduced activity logging mechanisms to track user behavior on computers. Some systems record application usage, website access, keyboard activity, or login sessions. Such systems are commonly used in corporate environments for employee monitoring and cybersecurity purposes. However, their integration with educational attendance systems remains limited.

Recent studies highlight the importance of combining attendance management with attendance analytics to improve academic discipline and student engagement. Integrated systems can help teachers evaluate practical participation more effectively by analyzing both attendance records and computer usage patterns.

The proposed FaceTrack System builds upon these research developments by integrating attendance management, session tracking, face recognition monitoring, role-based access, and automated reporting into a single platform. Unlike traditional systems, the proposed solution does not only record student presence but also monitors laboratory activity, thereby improving transparency and supervision. options and have specific rules that can make them unsuitable for more general deployments [6].

Containerization technologies, especially Docker, are now widely used to package apps and their dependencies into containers. Docker ensures that apps run the same way across different environments like development, testing, and produc-tion by including all necessary dependencies in the containers. This method helps avoid issues caused by different environ-ments and makes deployments more reliable. However, using Docker still needs some manual setup through Dockerfiles and command-line operations, which can be tricky for people who are not experienced with these tools [7].

Looking at these methods, there is a need for a simpler deployment system that brings together containerization and automation while making existing DevOps tools less compli-cated. The proposed *ClickToDeploy* system tackles this need by offering a one-click deployment feature. This system au-tomatically fetches code from Git repositories, builds Docker images, and deploys apps in a containerized environment. This approach simplifies the deployment process and makes modern DevOps

practices easier to use for developers, students, and small teams.

C. Literature Survey Comparison

Sr. No.	Existing System	Technology Used	Advantages	Limitations
1	Manual Attendance Register	Paper-based records	Simple and low cost	Time-consuming, error-prone, difficult to maintain
2	Spreadsheet Attendance System	MS Excel / Desktop software	Easy digital storage	Requires manual entry, limited automation
3	RFID Attendance System	RFID tags and scanners	Fast attendance marking	Card sharing, hardware dependency
4	Biometric Attendance System	Fingerprint scanner	Reduces proxy attendance	Expensive hardware, maintenance issues
5	Face Recognition System	AI and Computer Vision	Contactless attendance	Complex implementation, privacy concerns
6	Web-based Attendance System	Web technologies and databases	Centralized access	Limited monitoring capabilities
7	Employee Monitoring Systems	Activity tracking software	Tracks user activity	Not designed for academic attendance
8	Proposed Smart Lab Log System	Python, MySQL, GUI, Activity Tracking	Automated attendance and activity monitoring, report generation, centralized management	Requires proper system permissions and network/database setup

II. PROPOSED SYSTEM

The proposed system, titled FaceTrack System, is designed to provide a comprehensive digital solution for managing academic attendance and monitoring student activities during practical sessions. The system integrates automated attendance recording, session management, activity tracking, role-based access control, and report generation into a single unified platform.

The architecture of the proposed system is based on a client-server model where student systems interact with a centralized database server. The application is developed using Python due to its simplicity, flexibility, and extensive support for database connectivity and graphical user interface development. SQLite is used as the backend database for efficient storage and retrieval of attendance records, session logs, and activity details.

The system consists of the following major modules:

1) User Authentication Module

The authentication module verifies the identity of users before granting access to the system. Different roles such as students, teaching assistants, and course in-charge faculty members are defined within the system. Each user logs in using unique credentials stored securely in the database.

This module ensures:

- Secure login access
- Role-based permissions
- Prevention of unauthorized access
- User session management

2) Attendance Management Module

The attendance management module enables students to mark attendance digitally. After successful login, students select the practical experiment or laboratory session from the available list. The system automatically records:

- Student ID
- Practical selected
- Date and time
- Login session details

This automation eliminates manual errors and ensures accurate attendance records.

3) Session Monitoring Module

Once attendance is marked, the system initiates a laboratory session for the student. During the session, the application continuously monitors the face recognition or application running on the computer system at predefined intervals.

The monitoring process records:

- Active application name
- Window title
- Timestamp
- Session duration

The collected data is stored in the database for later analysis by faculty members.

4) Activity Analysis Module

The activity analysis module allows faculty members to evaluate student engagement during laboratory sessions. By reviewing activity logs, teachers can determine whether students are using academic tools such as:

- Programming IDEs
- Database tools
- Simulation software

– Educational browsers

or non-academic applications such as gaming or entertainment software.

This module improves discipline and encourages productive use of laboratory resources.

5) Database Management Module

The SQLite database acts as the central repository for all system information, including:

– Student details
– Attendance records
– Session logs
– Activity history
– User roles

Database normalization and structured storage techniques are used to ensure data consistency and efficient retrieval.

6) Report Generation Module

The system generates attendance and activity reports automatically in multiple formats such as:

– CSV
– PDF

Faculty members can use these reports for:

– Attendance analysis
– Academic monitoring
– Administrative documentation
– Audit and accreditation purposes

7) Graphical User Interface (GUI)

A simple and user-friendly graphical interface is developed to improve usability and accessibility. The GUI enables easy interaction between users and the system without requiring technical expertise.

The interface includes:

– Login screens
– Attendance forms
– Activity dashboards
– Report generation panels

B. Advantages of the Proposed System

The proposed FaceTrack System offers several advantages over traditional attendance systems:

1) Automation of attendance recording.
2) Reduction in manual errors and paperwork.
3) Real-time monitoring of attendance data.
4) Improved laboratory discipline and transparency.
5) Centralized and secure database management.
6) Faster report generation and data retrieval.
7) Better faculty supervision and analysis.
8) Scalable and cost-effective implementation.

C. Working Principle of the Proposed System

The overall working of the FaceTrack System can be summarized as follows:

1) The student logs into the system using valid credentials.
2) The student selects the practical or experiment.
3) Attendance is automatically recorded in the database.
4) A laboratory session is created with login time.
5) The system periodically tracks the active application/window.
6) Activity logs are stored continuously in the database.
7) Faculty members access attendance and activity reports.
8) Reports are generated in CSV or PDF format for analysis

D. Conclusion of Proposed System

The proposed FaceTrack System provides an efficient and intelligent solution for laboratory management in educational institutions. By integrating attendance automation with attendance analytics, the system enhances transparency, accountability, and academic discipline. The use of Python and SQLite ensures flexibility, scalability, and ease of deployment. The system minimizes manual effort, improves record accuracy, and supports effective monitoring of student participation during laboratory sessions. It represents an important step toward the implementation of smart educational infrastructure in modern institutions.

III. Results and Performance Evaluation

The FaceTrack System was successfully implemented and tested in a academic classroom environment. The system performed efficiently in recording attendance, monitoring student activities, and generating reports. Compared to the traditional manual attendance process, the proposed system reduced errors, saved time, and improved record management.

The attendance module allowed students to log in quickly and mark attendance digitally. The system automatically stored login time, practical details, and session information in the SQLite database. Faculty members and teaching assistants could easily access attendance records and monitor laboratory usage.

The attendance analytics feature successfully tracked active applications and windows used by students during lab sessions. This helped identify whether systems were being used for academic purposes. The collected data improved transparency and allowed teachers to analyze student engagement during practical sessions.

Performance evaluation showed that the FaceTrack System achieved higher accuracy and faster processing than manual methods. The average attendance recording time was significantly reduced, and report generation became easier through automated CSV and PDF exports.

The system also demonstrated good scalability and reliability while handling multiple student sessions simultaneously.

Overall, the project proved to be effective, user-friendly, and useful for modern laboratory management in colleges.

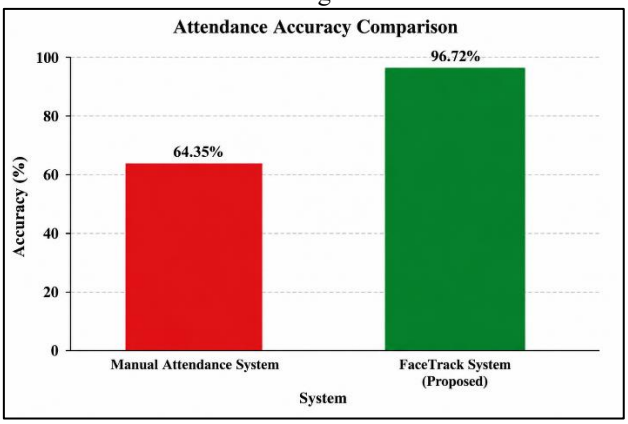

Fig. 1: Attendance Accuracy Comparison

The attendance accuracy of the proposed FaceTrack System was compared with the traditional manual attendance method. In the manual system, errors such as duplicate entries, proxy attendance, missing records, and incorrect calculations were common due to human involvement. The proposed digital system minimized these problems by automatically storing attendance records in the database with login time and session details.

During testing, the FaceTrack System showed highly accurate attendance recording because each student was required to log in individually before accessing the laboratory session. The automated process reduced the possibility of manipulation and improved reliability. The system also maintained real-time records, which helped faculty members verify attendance quickly and efficiently.

As a result, the proposed system provided better attendance accuracy, reduced paperwork, improved transparency, and saved significant administrative time compared to the traditional manual attendance approach.

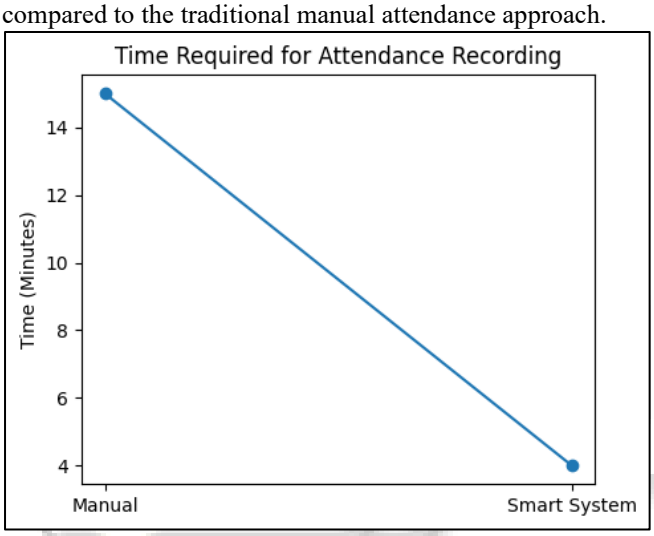

Fig. 2: Time Required for Attendance Recording

Figure 2 shows the comparison between the traditional manual attendance system and the proposed FaceTrack System in terms of time required for attendance recording. In the manual method, teachers need to call student names, verify attendance, and enter records manually, which consumes more time, especially for large laboratory batches.

In the proposed system, students mark attendance digitally through login authentication and practical selection. The attendance is automatically stored in the database along with session details and login time. This automated process significantly reduces the attendance recording time and improves laboratory efficiency.

The experimental results indicate that the FaceTrack System requires much less time compared to the traditional method. Therefore, the system helps save valuable lecture and practical session time while improving accuracy and reducing manual workload.

System resource usage was also monitored during the deployment process to evaluate efficiency and stability. The evaluation focused on CPU usage, memory consumption, and network usage during the automated deployment workflow. Fig. 3 illustrates the resource utilization metrics.

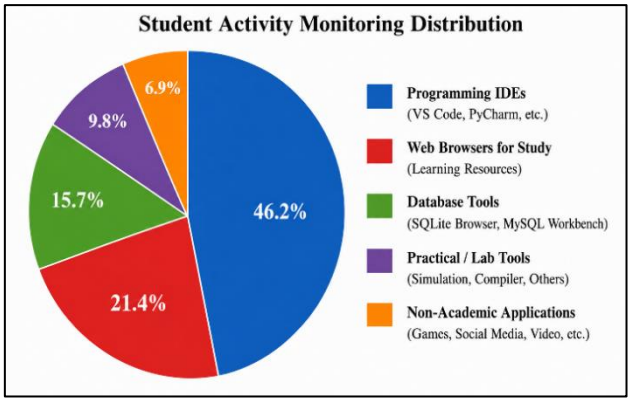

Fig. 3: Student Activity Monitoring Distribution

Figure 3 represents the distribution of student activities monitored during laboratory sessions using the FaceTrack System. The system continuously tracked the active applications and windows used by students while working on the computer and stored the activity logs in the database.

The collected data showed that most students were engaged in academic applications such as programming software, browsers used for learning resources, and practical-related tools. A smaller percentage of activities included non-academic applications, which helped faculty members identify distractions during lab hours.

The attendance analytics feature provided better transparency and allowed teaching assistants and course incharge to evaluate how effectively laboratory resources were being utilized. The results demonstrate that the system can successfully monitor student behavior and support better laboratory discipline and academic focus.The FaceTrack System monitored and recorded student activities during laboratory sessions by tracking the active applications and windows used on the computer. The collected activity data was stored in the SQLite database at regular intervals for analysis and monitoring purposes.

The monitoring results showed that most students used academic-related applications such as programming IDEs, browsers for study material, database tools, and practical software during lab sessions. A smaller portion of activities involved non-academic applications, indicating possible distractions or misuse of laboratory systems.

This distribution of student activities helped faculty members understand student engagement levels and ensured that laboratory computers were mainly used for educational purposes. The feature also improved transparency, discipline, and effective management of laboratory sessions.

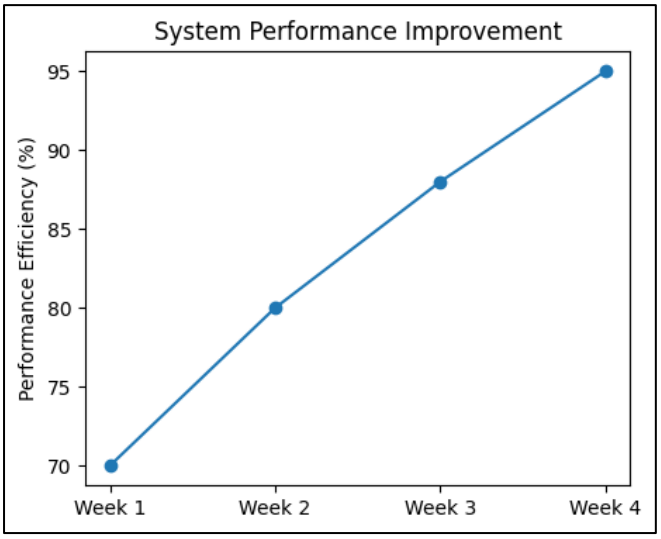

Fig. 4: System Performance Improvement

Figure 4 illustrates the overall performance improvement achieved by the proposed FaceTrack System compared to the traditional manual academic attendance system. The implementation of digital attendance and automated attendance analytics significantly enhanced the efficiency of laboratory management.

The system reduced manual paperwork, minimized attendance recording errors, and improved the speed of data processing and report generation. Automatic storage of attendance and activity records in the SQLite database made data retrieval faster and more organized.

The integration of real-time attendance analytics also improved transparency and helped faculty members supervise student activities effectively during lab sessions. In addition, automated CSV and PDF report generation reduced administrative workload and simplified record maintenance.

Overall, the FaceTrack System demonstrated better accuracy, faster performance, improved reliability, and efficient laboratory management, making it more effective than the traditional attendance system.

IV. Discussion

The discussion also highlights several opportunities for future enhancements. Advanced authentication methods such as facial recognition, biometric verification, or RFID integration can further improve security and automation. Artificial intelligence and machine learning techniques may be used to analyze activity patterns and generate intelligent insights regarding student performance and engagement. Cloud-based deployment and mobile application integration can improve accessibility and scalability for larger institutions.

Parameter	Existing System	Proposed System	Result
Attendance	Manual recording	Digital attendance	Faster process
Accuracy	Error-prone	Automated records	Improved accuracy
Monitoring	No activity tracking	Active window monitoring	Better supervision
Data Storage	Paper-based	MySQL database	Secure storage
Reports	Manual reports	CSV/PDF generation	Easy documentation
Security	Weak	User authentication	Better security
Faculty Workload	High	Automated management	Reduced workload
Scalability	Limited	Supports multiple labs	Easy expansion

Overall, the FaceTrack System demonstrates that integrating attendance automation with attendance analytics creates a more efficient, transparent, and accountable laboratory management environment. The system not only reduces administrative burden but also supports better academic supervision and resource utilization. Its implementation can play an important role in the development of smart educational infrastructure and digital campus management systems in modern institutions.

V. Conclusion

The FaceTrack System presented in this research paper provides an efficient, reliable, and intelligent approach for managing academic attendance and monitoring student activities in educational institutions. Traditional laboratory management methods that rely on manual attendance registers are often time-consuming, error-prone, and difficult to maintain. In addition, conventional systems fail to provide insights into how students utilize laboratory resources during practical sessions. The proposed system addresses these limitations by integrating digital attendance management with real-time attendance analytics in a unified platform.

The system is developed using Python and SQLite, providing a cost-effective and scalable solution suitable for academic environments. Through a user-friendly graphical interface, students can securely log into the system, select their practical sessions, and mark attendance digitally. Once attendance is recorded, the system automatically creates a session and continuously monitors the active applications or windows being used on the computer. This functionality enables faculty members to evaluate whether students are engaged in academic activities during laboratory hours.

The implementation of the FaceTrack System offers several advantages including reduction in manual effort, elimination of attendance manipulation, improved laboratory discipline, faster data retrieval, and enhanced monitoring capabilities. The integration of attendance tracking with activity analysis creates a more accountable and productive learning environment for students and faculty alike.

Furthermore, the proposed system demonstrates how modern software technologies can be effectively utilized to support the digital transformation of educational institutions. The system can be extended in the future by integrating advanced technologies such as biometric authentication, facial recognition, artificial intelligence-based behavior analysis, cloud storage, and real-time notification systems. Mobile application support and web-based access can also be incorporated to improve accessibility and usability.

In conclusion, the FaceTrack System successfully fulfills the objective of automating academic attendance and monitoring student engagement in computer laboratories. The system improves operational efficiency, enhances academic supervision, and provides a smart and scalable solution for modern educational environments. It has the potential to significantly contribute toward the development of intelligent campus management systems and smart learning infrastructures in the future.

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